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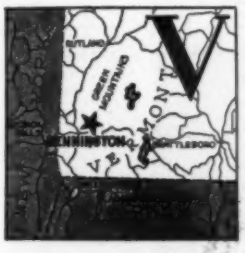
Rebuilding Vermont Roads and Bridges Following the 1927 Flood

Surveys Made of Damaged Area Under Severe Winter Conditions Quickly Followed by Unprecedented Highway and Bridge Construction



VERMONT is only 90 miles wide across its northern boundary and 45 miles wide across its southern boundary and about 150 miles long. Within this small area damage to the extent of $4,500,000 was done to bridges and $2,654,000 to roads during the first week of November, 1927, by floods caused by unprecedented rainfall. In the north, at Burlington, the rainfall was 5.62 inches in 47 hours and in Northfield at about the center of the state, the rainfall was 8.63 inches in 45 hours. Within the borders of Vermont are 32 principal rivers, many of which wandered from their banks, causing the extensive damage to highways and bridges. In all, 1,214 bridges were damaged in the 1927 flood.

The Vermont Legislature voted $8,000,000 to reimburse the cities to the full extent of the flood damage and the Federal Government, through the Bureau of Public Roads, allotted $2,650,000 of Federal Aid to reconstruct the bridges and highways for permanent structures.

Prior to 1927 Vermont usually built about 20 miles of hard-surfaced pavement a year. In 1927, 48 miles were built. During 1927 plans were made for constructing all bridges with at least a 21-foot roadway and capable of supporting 15-ton trucks. It had been decided that all structures, both highway and bridges, in the future would be of the best and permanent construction. The program of the State Highway Department was materially accelerated by the floods as it was deemed advisable to rebuild with only the best materials.

Within a few days after the flood waters had subsided, 14 surveying parties were in the field working on bridges where normally the State used only 3 parties. The most needed bridges were started at once in spite of the cold weather. Calcium chloride was used and the concrete kept at a temperature of 75 degrees for 14 days to speed up the bridge reconstruction program.

Costs of Paving

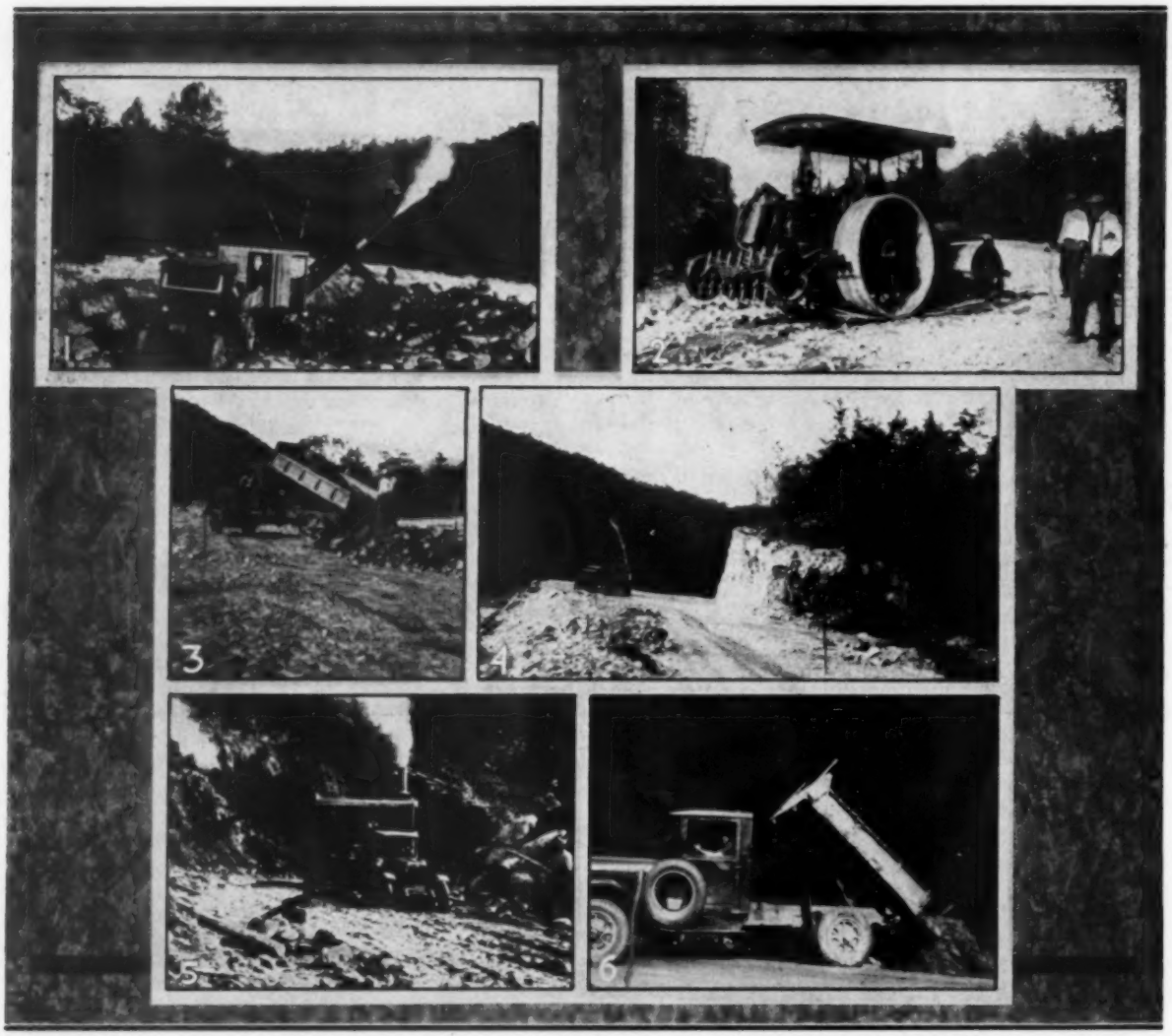
It is interesting to note that the costs of paving were not increased materially by the tremendous construction program. The average cost per mile over a six-year period prior to the intensive 1928 construction due to the flood was $25,046 per mile for gravel, $33,840 for bituminous macadam, $42,476 for portland cement concrete. The averages during 1928 have been $27,289 for gravel, $37,000 for bituminous macadam and $49,000 for portland cement concrete. The increased cost is in large measure due to the additional amount of fill, grading and base required on the roads built in the 1928 program. Construction engineering costs were found to amount to about $1,275 per mile or between 3½ and 4 per cent of the total cost of the pavement.

Design

Vermont design calls for the use of 6 to 10 inches of

Setting Up Complete Acme Crushing and Screening Plant With Waukesha Motor on River Bed to Produce Crushed Stone for Bituminous Macadam Surface Near Bennington

gravel as a base for concrete roads where adequate side drains are possible. If there is no good drainage, the subbase is increased. A 7-inch uniform concrete slab is used, usually laid in two strips, each 9 feet wide, with a double bar mat of ⅜-inch bars weighing about 83.2 pounds per 100 square feet. These bar mats are laid on steel chairs to space them properly in the road. They are fabricated off the road by two men and are easily handled in place by two men. Vermont has tried the thickened edge pavement, but it has not been deemed necessary with the double bar mat reinforcing.



REESTABLISHING THE GRADE ON ROUTE 9 EAST OF BENNINGTON, VERMONT

1. Erie steam shovel in stream-bed loading stone and gravel on to Federal truck. 2. Buffalo-Springfield steam roller compacting fill. Note birch trees under rear rolls to prevent skidding. 3. Ward-La France dump truck delivering stone at edge of fill above stream. 4. Cliff cut back and fill widened at point where entire road was washed away in the November 3-4, 1927, flood. 5. Erie steam shovel in pit loading hardpan for subgrade. When wet the material was "soupy," and when dry it could scarcely be worked with a pick. 6. Reo truck with Wood hydraulic hoist dumping hardpan on subgrade

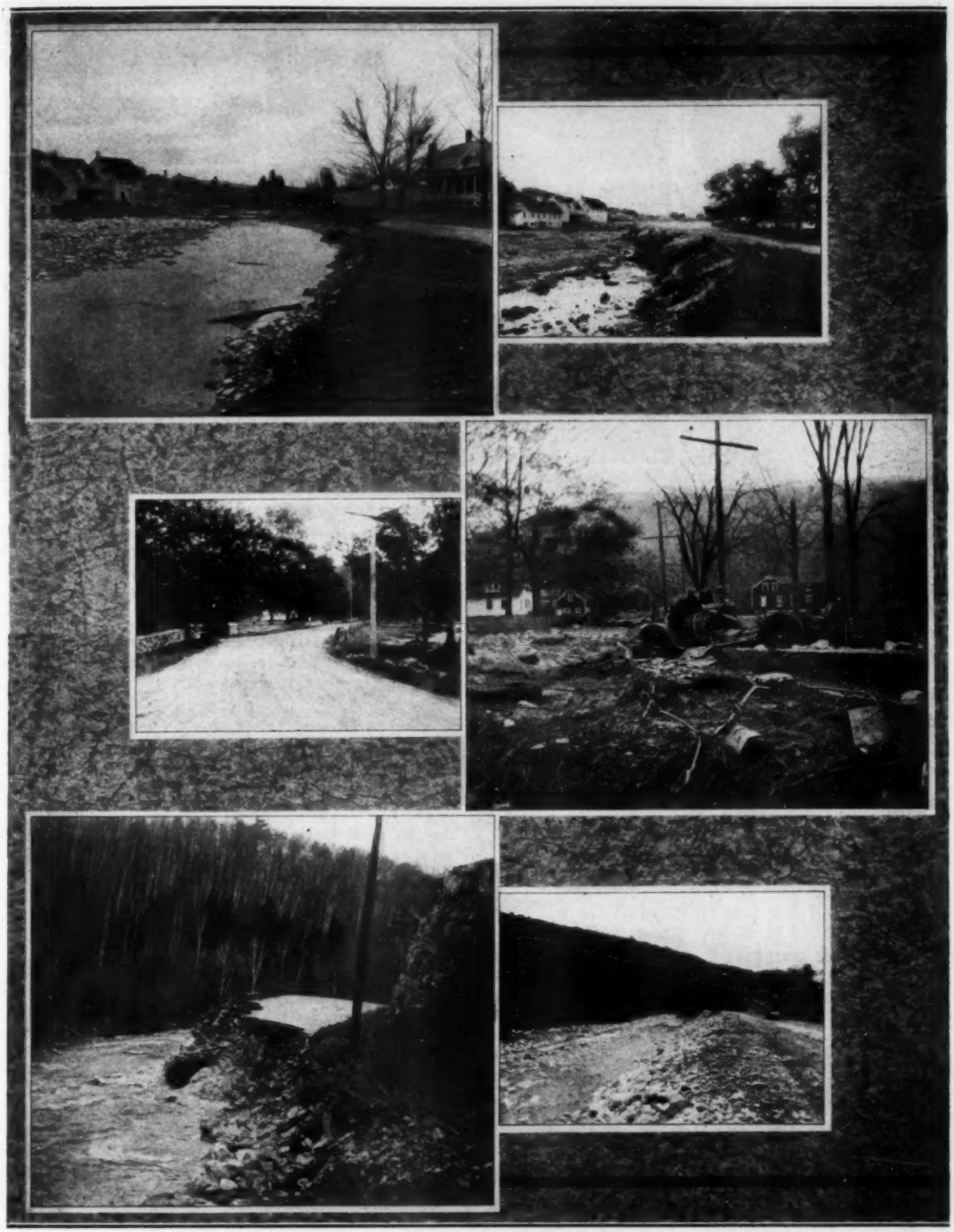
REASONS FOR CRACKS IN OLDER CONSTRUCTION

A careful analysis of cracks in concrete pavements in all parts of the state has led to the assigning of the trouble to about three causes. First, an insufficient base over the clay subsoil. This is overcome by raising the subgrade and where there is ledge the gravel is put in to provide porous material for side drainage. Second, lack of proper lapping of reinforcement. The former design called for a 6-inch lap. This has now been increased to 12 inches with the bars clipped at all laps. Third, culverts have been a serious source of cracks where the slabs bridge the culverts. Now, an expansion joint is installed over the center line of each culvert and it has been found to be remarkably free from bumps and also to do away with cracks.

No trouble has been experienced with corner breaks in Vermont, due probably to the fact that two extra bars are used in the reinforcing at the corners.

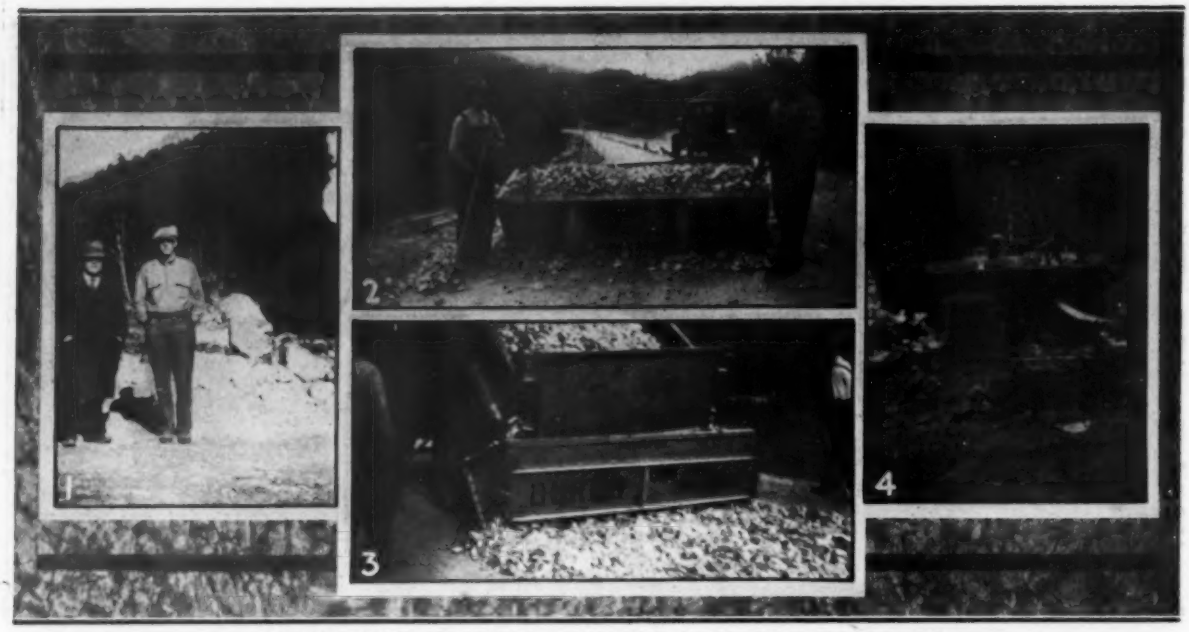
MACADAM AND GRAVEL ROADS

The design of macadam roads in Vermont calls for 9 or 12 inches of subbase of field stone, laid on a 3- or 4-inch sand or gravel cushion. This is levelled off and



PICTURES TAKEN BEFORE AND AFTER VERMONT'S FLOOD, NOVEMBER, 1927

Top—Washout in Village of East Burke.—Several houses and approximately 30,000 cubic yards of material were swept away by the high water. The rebuilt street is shown in the right-hand view. Middle—Damage on Road from Bennington to Brattleboro in Town of Bennington, showing damage directly after flood and as a reconstructed project at left. Bottom—In Town of Woodford, showing bad washout and road being reconstructed as a bituminous macadam road under contract to D. S. McGrath, Inc. The photographs in this set were furnished through the courtesy of Hubert E. Sargent, Chief Engineer, State Highway Commission



SCENES ON THE McGRATH CONTRACT AT BENNINGTON, VT.

1. At left, John J. McGrath, Superintendent of Construction. 2. Stone spreader ready to be attached to dump truck. 3. The Burch spreader laying the base course. 4. The Acme crushing and screening plant with Waukesha motor in foreground.

is excellent for preventing clay from working up into the subbase. A 2- or 3-inch base course is laid covered with a 3-inch surface course, which is bound with 2¼ gallons of asphalt per square yard.

Gravel paving is laid 21 to 24 feet wide and usually 5 inches thick. On Federal Aid projects, however, a 5-10-5 depth is used.

BRIDGE CONSTRUCTION

A total of 185 bridges, including 75 steel superstructures, have been built within the past year in Vermont to replace some of the larger bridges which were washed out in the flood. Many of the smaller structures were handled entirely by force account and by the towns in which they were located.

It was found that complete standardizing was impossible, but sets of plans were drawn up as rapidly as possible under the direction of the bridge engineer of the State Highway Department, to furnish a basis for the work which had to be completed at the earliest possible date. A standard slab bridge with spans of 4 to 20 feet was designed in increments of 2 feet. Structures of from 20 to 50 feet were designed as T-beam bridges in increments of 5 feet. I-beam bridges were also designed for spans from 25 to 70 feet by 5-foot increments with concrete floors. It was found that T-beam and I-beam bridges cost about the same. Culverts were similarly standardized.

BRIDGE ABUTMENTS

The standardized plans made use of gravity abutments for heights from 4 to 6 feet. Reinforced concrete abutments were designed for heights of 10 to 20 feet by 2-foot intervals. These were half and half reinforced and gravity abutments because of the cost of gravity abutments above 10 feet. All abutments over 25 feet in height were designed specially.

CONTRACTS LET IN 1928

According to a report of Hubert E. Sargent, Chief Engineer, State Highway Board, the approximate contracts let in 1928 for various types of roads and bridge structures, are as follows:

57.4 miles concrete road, $2,914,681, inc. four bridges
5.8 miles macadam road, $229,900, inc. one bridge
16.6 miles gravel road, $829,000, inc. six bridges
99 concrete bridges, $797,000
73 steel bridges, $1,828,000

REPAIRING HIGHWAY DAMAGE BY FLOOD AT BENNINGTON

The rainfall in the Bennington area during the two-day storm of November 3 and 4, 1927, amounted to a total of 7.36 inches, with a maximum of 6.83 inches for one day. This almost unprecedented rainfall caused the feeders of the Hoosic River, flowing east of Bennington, to change their courses and completely wash out the highway about two miles east of Bennington.

The Sunday following the flood the entire male population of Bennington was enlisted to load rock by hand on to trucks that this vital artery of transportation between Bennington and Brattleboro might be restablished. After church Sunday laborers and professional men worked untiringly throughout the day in the first step in rebuilding this highway.

As soon as the exact extent of the damage could be ascertained, and surveys made, the State Department of Highways called for bids for grading and paving.

As a means of reestablishing the stream bed and also facilitating the borrow necessary to make the long fills in the washed-out area, the State Department of Highways required that borrows be taken from the stream beds, and then after all fill had been completed that the power shovels be placed in the stream to cast up the stones and gravel to reform the banks.

The contract for the 3.6 miles of fill and subgrade east of Bennington on Route 9 was awarded to D. S. McGrath, Inc., of Adams, Mass. An Erie steam shovel

was placed in the stream bed as shown in one of the illustrations and a fleet of trucks installed to haul about 45,000 yards of stone and gravel from the river for fill. The contract was started about July 10 and the work was to be completed in 125 days, but the extent of extras will continue this work over into the next construction season.

The fill required for building up the grade of the road about two miles from the west end of the job was furnished from a hillside of hardpan. The continued rains, however, had soaked this hardpan so that it was very difficult to handle, but when it dried out on the road, unless graded at once, it became almost too hard to work by hand pick.

All new fill was spread in 12-inch layers, graded by hand and blade grader and then rolled with a 10-ton Buffalo-Springfield steam roller. The small boulders were so smooth and hard that at times it was impossible for the roller wheels to get any purchase and the machine skidded. As soon as this started small birch trees were thrown in under the wheels, making it possible to gain a hold and prevent the possibility of the roller slipping off the fill.

At one point where a vertical cliff of rock located about one-half mile from the west end of the contract withstood the wash of the river an exceptionally large fill was made. A separate contract was let with D. H. Snyder of Massachusetts for the cutting back of this cliff. The contract was awarded at a very low figure and the rock turned out to be unusually hard to drill, but the contractor finished the job satisfactorily.

D. S. McGrath set up a complete Acme crushing plant on the river wash to furnish stone for the bituminous macadam surface. The subbase of the road is made up from 6 to 10 inches of quarry or river stone with 3 inches of crushed stone as a base and the 3-inch penetration macadam over this using Standard asphalt.

John J. McGrath was Superintendent on this work with Edward S. Buss as Assistant Superintendent.

Building Code Amendment Brings Saving to Builders

AN amendment to Chapter 5 of the Code of Ordinances known as the Building Code has been adopted by the Board of Aldermen of the City of New York, by increasing the working stress in structural steel. By this action the builders of New York are insured a saving of approximately $6,000,000 a year on current contracts for new structures. The amendment was based upon a standard specification of steel construction recommended by the American Institute of Steel Construction, Inc.

This amendment was introduced on January 24, 1928 at the request of the Committee on City Departments, of which Charles E. Meyers is chairman and which represented jointly the New York chapter, American Institute of Architects, American Institute of Consulting Engineers, Building Trade Employers Association, Iron League of New York, Brooklyn chapter, American Institute of Architects and New York and National Board of Fire Underwriters.

The old building code permitted a basic working stress of 16,000 pounds per square inch. Under the amendment the basic working stress may be increased to 18,000 pounds per square inch. Applied upon a more economic basis this reduces the amount of steel going into a building by at least 10 per cent. By reason of this change, estimated on current contracts, New York itself will save approximately $500,000 a year on school buildings alone.

According to Charles F. Abbott, Executive Director of the American Institute of Steel Construction, this amendment will bring the Building Code of the City of New York into conformity with the codes adopted by practically all cities of the United States and this change throughout the country will effect a saving of $30,000,000 a year to American builders.

Hauling with Trucks in Highway Grading

TRUCKS of various kinds are very frequently used to transport the output of power shovels on highway work. Studies made by the Division of Management, U. S. Bureau of Public Roads, indicate that opinion is far from uniform as to the most desirable type of truck or such points as tire equipment, carrying capacity, dumping arrangement and body types. Practically all of the common types of trucks now in use for general hauling have been found on grading projects and in capacities ranging from the light 1-ton to the heavy 7-ton truck.

With such diversity of types, it is only natural that wide variation should also be found in the efficiency with which they meet the specialized requirements of highway grading. Moving material from the shovel to the dump is quite different from highway transportation and there are little or no dependable data to guide the grader contractor in selecting trucks for hauling. Both successes and failures have been found during the Bureau of Public Roads studies.

The truck is a well-built, dependable machine, but moving material from the shovel to the dump sometimes offers so many adverse conditions over soft ground, rough going and difficult grades that there is probably no field in which operating conditions are more variable and severe. Wear and tear on vehicles is often excessive, the speed much reduced and operating costs abnormally high when compared with production. This is a condition which should not be attributed to shortcomings of the truck as a hauling unit, but is due very largely to poor judgment in selecting the proper truck for the job to which it is not suited, to the selection of the wrong kind of trucks or to the lack of ability in their management on the job.

Big West Coast Grading Project

ONE of the largest projects now under way on the West Coast involves the grading and surfacing of approximately fifteen miles of highway on the scenic Skyline Boulevard leading south from San Francisco through the Santa Cruz mountains. Twohy Brothers Co., and J. F. Shea Co., of San Francisco, are the contractors.

Work on the project was started late in May, 1928. There was almost a million cubic yards of excavation to be made before the rainy season started in. The contractors placed seven large shovels on the job and worked on a double shift basis. Failure to complete excavation before the rainy season starts means that it will be impossible to get on the job until late next spring and this would possibly delay completion of the surfacing beyond June 1, 1929, the date the contract is to be completed. On October 1 the excavation was approximately 65 per cent completed. About 200,000 cubic yards is being handled monthly.

The project involves 908,000 cubic yards of roadway excavation at 50 cents a yard; 1,018,000 station yards overhaul at 2 cents a yard; 10,300 cubic yards structure excavation at $1.25 a yard and 38,100 cubic yards of gravel or stone surfacing at $2.90 a yard. The contract price is $652,238.

Equipment on the project includes four 1¼-yard Northwest gas shovels, two 1¼-yard Erie Gas Air shovels and one 1¼-yard Thew-Lorain gas shovel, 18 Mack and White trucks, 6 Ingersoll-Rand compressors, three Thirty and three Sixty Caterpillars, two McMillan bulldozers and two blade graders.

The contractors have established camps at two points. Camp No. 1 is located near Los Altos and Camp No. 2 near Saratoga. Excavation is being carried on from both ends and from the middle of the project. About 130 men are being employed.

Contractors' Mistakes as Seen by an Engineer

By Major Preson P. Phillips,
Designing Engineer, Gilbert C. White Company, Durham, N. C.

IN DAYS when work is a little scarce and hard to find, quite a good deal is being written and said about contractors taking jobs at prices at which it is impossible for them to make a reasonable profit. The writer often wonders if these statements are not based on figures at which some other contractor must have it in order for him to make a profit. Observation has shown that some contractors can make a profit on a job at a price at which four others would lose money, and the few following facts and figures will show some of the ways in which this might be done by an efficient and skillful man in charge of the actual constructon work.

Estimating

In starting, however, it does appear that many contractors do estimate a job more by guess work guided to some extent by their experience, rather than by the actual quantities as taken from the plans. Judging from the bids received at recent lettings, many contractors make no attempt to take off quantities in detail, whether this is due to the small time they allow themselves actually to figure the work or to ignorance, the writer does not know. It is nothing unusual for the bids on a job to run as much as 20 per cent above or below the estimate of the engineer, or what proves later to be the actual cost. As an example, in a recent letting, on one item that was really quite simple to figure, the bids ran from $84,000 to $129,000, the estimated and actual cost being around $85,000, which amount allowed a reasonable profit. On another item in the contract the bids varied from $9,600 to $14,700, both contractors specifying the same equipment and materials.

A contractor is in the business to make money, the engineer wants him to make money because when he makes money he does better work, and the owner expects him to make a reasonable profit also, and neither the engineer nor the owner wants him to attempt a job on which he is pretty certain to lose money at the prices he bids. If a contractor does not have a man in his organization who is capable of taking off quantities and applying prices in such a manner that his bid will be reasonably sure to make him a profit, he should by all means seek outside help, and get the quantities taken off by a man who does know how; it will be well worth the money he pays for this service.

Purchasing

Many contractors, after being awarded a contract, do not have a purchasing agent or department really capable of ordering out the materials for a job at the proper time and in the proper order. A typical example of this was noticed on a recent sewage disposal plant job. Within a month after the awarding of the contract there was shipped to this job pumping equipment valued at around $10,000 that was not used for over six months. During this time the contractor had to provide housing for this machinery, and it, of course, got rusty and had to be cleaned and polished before being used, and the contractor lost the interest on his money for this length of time. At the same time, on this same job, steel was delivered, valued at several thousand dollars more, that could not be used for several months and for which the contractor provided no housing. When he was ready to use this steel it was so dirty and rusty that all of it had to be brushed before it was allowed in the work. Here again, if we consider the cost of brushing and the interest on his money, this was a very expensive experiment on the part of the contractor. This same contractor, considered a good man in his field, has done this same thing before and will do it again, perhaps wondering why his profits are less than they should be. If he does not have time to do it himself, he should, by all means, have in his organization a man who is capable of estimating the speed with which his organization can accomplish a given job, so that he can have the materials ready in plenty of time, but not so far ahead of time that it will take too much away from his profits. The logical man to designate the order in which the materials shall be delivered is a trained superintendent.

Care of Materials on the Job

And speaking about materials, a contractor will usually find the savings very much worth while by providing sufficient storage so that his materials can be kept out of the weather and in an orderly manner. There is usually provided on the job a good cement house because this is required by the engineer; generally there is a small shed to keep tools and nails in; and naturally the superintendent will provide himself with a fairly comfortable office; but as a rule this is as far as he goes. His steel comes and is stacked here and there about the job on the ground and in the weather, and in a month is covered with dirt and debris and overgrown with weeds and grass if not used before this; it is, in fact, hard to find at all if there are many short pieces, and the writer has seen much extra steel ordered because some of the original shipment was lost after it arrived on the job. If he can find his steel, and is allowed to use it all, it must be brushed. This brushing costs money, much more usually than it would have cost to have housed it in the first place, where it would have been kept clean and orderly and could easily be found.

The contractor, or rather the superintendent on the job, is just as careless about his lumber. Usually no

attempt is made to house this, in fact, it is very seldom even stacked, but merely thrown off the delivery wagon at various places about the job. As a consequence of this, much of it becomes distorted by the weather and cannot be used. This is especially true if the lumber is thin. After having been used in the forms, much of the lumber could be used over again, but instead of the superintendent having the forms torn down, the lumber taken apart and returned to stock piles, the forms are usually left intact just where and how they were removed from the concrete, piled indiscriminately here and there about the work and possibly not even cleaned, and no attempt is made to use it again until all the new lumber has been used up; by this time much of it is unfit for further service. There is really nothing to be gained by leaving these old forms in sections; they must be taken apart when cleaning up at the end of the job, and it would be just as easy to have it done as they are removed, besides making the lumber available for further use.

MORE CARE AND THOUGHT WOULD TURN THESE ERRORS INTO PROFITS

1. *Inside of a 98 per cent complete structure, showing old form work taken down several months before and still in the water covered with green scum.* 2. *This structure shows the effect of using thin lumber for forms. Note also the general appearance of the area around it.* 3. *A so-called steel stockpile. Note the steel lying about on the ground mixed up with other materials.* 4. *Another stockpile. It took a man two days to find some valves needed for a particular location on this job.*

THIN FORM LUMBER

Most contractors make the mistake of trying to save money by using thin lumber unless the thickness is specified by the Engineer. Three-quarters and even seven-eighths inch material is too thin to use on any structure of any heighth or any structure that must be finished smooth. A thin board, no matter how closely the cleats are nailed together and no matter how carefully it is nailed to the cleats, and no matter how carefully it is oiled before the concrete is poured, will warp and leave the imprint of each individual board on the surface of the concrete. On a recent job the contractor spent much more actual money trying to get these board marks out of his walls than the heavier lumber would have cost, and even then did not get the finish on the work that he should have, and in addition to this his thin lumber became so distorted that he was able to use very little of it more than once.

No lumber less than one inch after it is finished should be used in any structure, and one and five-sixteenths is preferable. Generally speaking, one-inch stock, dressed both sides, should be used for floor sheathing; one and five-sixteenths inch dressed stock for column and wall sheathing; and one and three-quarters inch dressed lumber for beam and girder bottoms. Joists, studs, girts and posts should be so placed as to hold these rigid. It is usually best to have lumber dressed on four sides, and for smooth surfaces to use tongue and groove lumber. Lumber which is only partially seasoned is best for form construction. Kiln-dried lumber has a tendency to swell, causing bulging and distortion. Green lumber, if in place too long before the concrete is poured, has a tendency to shrink, leaving cracks, but this can be partially prevented by keeping the forms thoroughly wet until the concrete is poured.

CLEANING UP

Many contractors and superintendents have one

thought only in their minds, to get the job done, and they think they will get it done more quickly and cheaply by leaving the finishing touches and cleaning up to be done at the end of the job. This is a big mistake. This cleaning up has to be done at some time, so there is no saving of time, and not cleaning up makes movement about the area much slower, and therefore really slows up the work, not to mention the impression an untidy area with many partially completed structures makes on visitors, and many of these visitors are men who will want similar work done themselves. This can be illustrated by a recent job visited by the writer. There were eight structures to be built. Two of these were about 98 per cent completed; four were about 95 per cent completed; one about 50 per cent completed and the other just getting started. But here were six structures, practically completed, and all materials on hand to complete them, at which time they could have been cleaned up and put on display. This was a municipal job and attracted many visitors, but imagine the thoughts of the visitor when he looked down in a concrete structure, practically complete, and saw a lot of old forming in it just as it had been stripped off several months before, and in addition to this 8 or 10 inches of water in it covered with green scum. Of course it will look pretty when it is completed, the lines are good, but the combination of these uncompleted structures with old forming, steel, lumber and excavated material scattered around promiscuously does not help the reputation of the contractor or the superintendent. Were the writer in charge of such a job, he would see that where all materials were available and other considerations allowed it, each structure was 100 per cent completed and the area around it dressed up and kept that way. It would really take no more time, cost no more money, and yet would give something to put on display for the benefit of the visitors. Even though lack of materials prevented making it 100 per cent complete, when one structure was left for another it would have to be cleaned and washed out and materials picked up from around it and the backfilling completed.

CARE OF EXISTING STRUCTURES

Another thing about which some contractors are careless is the care of existing structures. On a recent job, within the city limits, it was necessary for the contractor to carry his materials over a sidewalk. For a few dollars he could have had several heavy ramps built to distribute the load from the wheels of the trucks, and thus have left the sidewalk uninjured. Instead of this, the trucks were backed directly on the sidewalk, not in one place but for possibly fifty feet along the work. Needless to say the contractor had to replace this stretch of sidewalk, at many times the cost of ramps.

CARE OF EQUIPMENT

Another thing frequently overlooked by the contractor or his superintendent is the care of his equipment. His mixer, wheelbarrows and other tools are not thoroughly cleaned after each run and consequently before beginning the next run it is necessary to get hammers and knock off the hardened concrete. Needless to say, this materially shortens the life of the equipment. Again you go on a job and you will find many pieces of equipment, wheelbarrows, etc., not being used because of some small defect, something that could be repaired in perhaps half an hour. Usually new equipment is purchased and the old is left around the area somewhere, exposed to the weather, and at the end of the job is useless. Steam shovels, pumps, mixers, etc., are left out in the weather for months at a time without being used or housed. On a recent job it was necessary to pump out an excavation preparatory to building forms the next day. An old pump, shipped in from another job, was put to work, got the hole almost dry and then broke down for the rest of the night. By morning the hole was filled again and the carpenters had to wait for the pump to be repaired and put to work again, and half a day had been lost by this skilled labor. This pump was only casually inspected before being put to work. It would seem that it would be almost a necessity for any contractor with much equipment to have a shop and storage house to which his equipment could be shipped for overhauling.

THE SUPERINTENDENT

Mention could be made of one thing after another that have been seen to be handled very carelessly on various jobs, and in ways to cause the contractor to lose money, but we will now come to what the writer considers the cause of all of these troubles and a lot more similar ones, and the thing that often makes the contractor show a loss on a job where he should show a profit. Most contractors do not have on their jobs men who are really qualified by training and experience to be superintendents. This conclusion has been reached not only from observation but has been admitted to the writer by several contractors. They take a good carpenter foreman and make a superintendent out of him with disastrous results. He knows how to get a structure built in his own way but he cannot visualize the job as a whole, nor will he make a very serious effort to try to save the contractor money; he does not think he is getting paid to do this and usually he is not. A contractor admitted to me that he had lost over $5,000 on a recent job, completed in about eight months, on which he should have made a profit, because he did not have a competent superintendent in charge of the work, and he would have lost much more than this had there not been a really capable Resident Engineer who really did the superintendent's work.

The foreman is given the job as superintendent, of course, because he is a cheaper man. The contractor figures he can make fairly frequent visits to the work and keep him straightened out. During his visit he manages to get things going pretty well, but the day after he leaves the superintendent goes back to the old order of things and the contractor begins to lose money again. Perhaps his next visit is postponed on account of other business, and things go from bad to worse, until on his next visit he must stay several days to get things back to normal, if he is able to do it at all. In such a case he must add the cost of his time to what he is paying his superintendent, and invariably he will find that his superintendent is really costing him more that he would have to pay a really capable man, one who could not only supervise construction but help him figure a job and order out materials when and where needed, and he will get the job done more quickly and more satisfactorily to all concerned.

Old 16-Foot Brick Road Resurfaced With 20-Foot Concrete Slab

The Clements-Orr Company Well Organized On Slag-Concrete Project Near Solon, Ohio

BECAUSE of wide variation in the weight of slag as received from the blast furnaces, the Clements-Orr Co. on its Intercounty Highway Project No. 460, Sections B1, B2, and C, east of Solon, Ohio, in Cuyahoga County, measured the slag by volume and the sand by weight to secure the best results for the 1:5 mix specified by State Department of Highways. Another departure from what has been considered standard practice for a period of years was the omission of any transverse expansion joints from the concrete slab. There were, however, other concrete jobs in Ohio this construction season on which the expansion joints were specified.

Central Proportioning Plant

The unloading plant for aggregate and the cement storage shed were located at the west end of the 8-mile project. Slag from the McKinney Steel Co., Cleveland, Ohio, was received in hopper-bottom railroad cars, dumped into a track pit and from there loaded to the stock pile by a Galion unloader. Sand from the Mantau Sand & Gravel Co., Mantau, Ohio, was likewise received by rail and similarly unloaded. The slag storage was on the east and the sand on the west sides of the Blaw-Knox steel bins, which were served by an Osgood gas shovel with Owen clamshell. The bins were equipped with the required measuring batcher for the slag and weighing hopper for the sand.

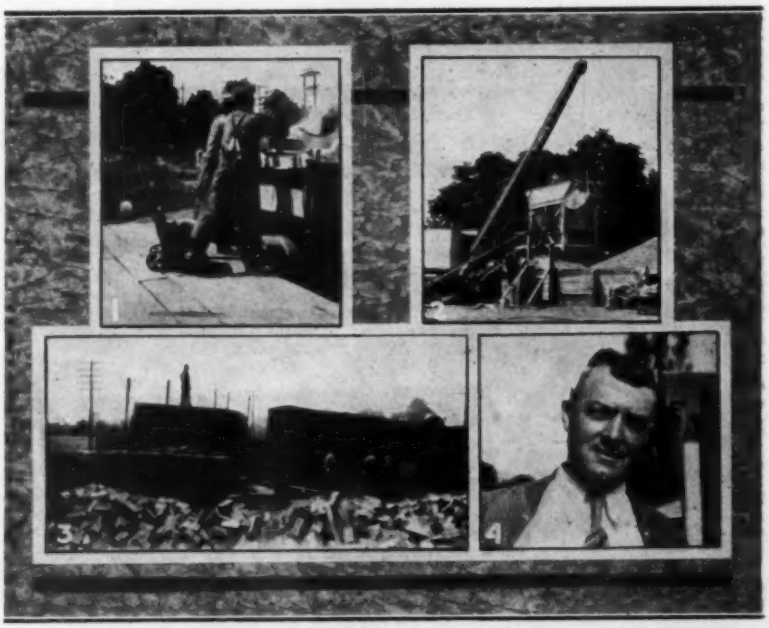
A fleet of Autocars varying in number from seven to twelve and carrying three batches per load received their batches at the bins, and then proceeded about 450 feet west to the cement shed, where hand trucks with seven bags of Standard cement were quickly emptied onto the batches. Three men were required to handle the unloading of the cement at the car and piling it on the hand trucks ready for the trucks to avoid delay.

Preparation of Subgrade

As 16 feet of the 20-foot section to be concreted was an old brick road little preparation of the subgrade was required. The widened section was graded with a blade grader hauled by a tractor.

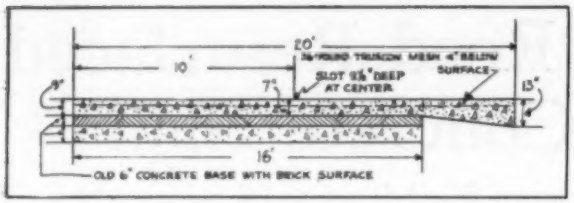
The section of this pavement is a bit unusual although it was used considerably throughout Ohio this year in resurfacing projects involving old brick roads which were being widened. The old road in this case was of brick on a 6-inch concrete foundation and had been laid 16 feet wide. The concrete slab starts at one side of the old monolithic brick slab and is 9 inches thick. Ten feet over, the center point of the concrete, it is 7 inches thick, at the other edge of the brick it is thickened to 9 inches again and then further thickened to 13 inches at the far edge 4 feet from the brick slab. This is designed to give equal bearing across the slab.

The fine grading and form-setting operations were under the same foreman. To secure a uniform section a wooden template was made to conform to the shape of the desired section and used to aid the gang in the fine grading. Prior to setting the forms the subgrade was rolled with a 10-ton Buffalo-Springfield roller. The foreman and 16 men then set the Heltzel 9- and 13-inch steel forms at the outer sections of the road.



MATERIAL HANDLING AND PERSONNEL FOR AN OHIO RESURFACING JOB

1. Loading Crescent cement in bags from hand truck to batch on motor truck. 2. Galion unloader moving slag from track pit to boarded stock pile. Osgood crane serving the Blaw-Knox bin and batchers. 3. Unloading and stacking Truscon welded reinforcing mats near unloading plant. 4. Day A. Orr, Vice-President, Clements-Orr Co., contractors, Mt. Gilead, Ohio



Section Showing Old Brick Road on Concrete Base, and New Concrete Surfacing

CONCRETING OPERATIONS

As the trucks with the batches approached the mixers two men climbed onto them and emptied the seven sacks of cement into each of the batches. The trucks turned on the subgrade through a breach in the forms, thence backing to the Foote 27E paver. As each batch was dumped into the mixer by the skip man the previous batch having been mixed the full 1¼ minutes required was emptied into the bucket and spread on the subgrade. The mix specified, 1:5, using a proportion plus the allowance for bulking of sand, which produced the best results according to the field tests conducted by the state and county inspectors.

IMPRESSED CENTER JOINT

The Heltzel impressed center joint was used on this work with success. Following about fifty feet behind the mixer the joint machine moving under its own power cut the fresh concrete slab and inserted 6-foot channels with steel strips in them to align the separate channels. At a time interval varying from twenty to thirty minutes and arrived at by experience with the specific concrete being used a moving bridge was moved over the channel and the channel was removed by hand leaving a slot 2½ inches deep. This was hand-finished with a special tool and remained in the road as a plane of weakness to control the longitudinal cracking. After the curing period was over the slot was poured with hot asphalt.

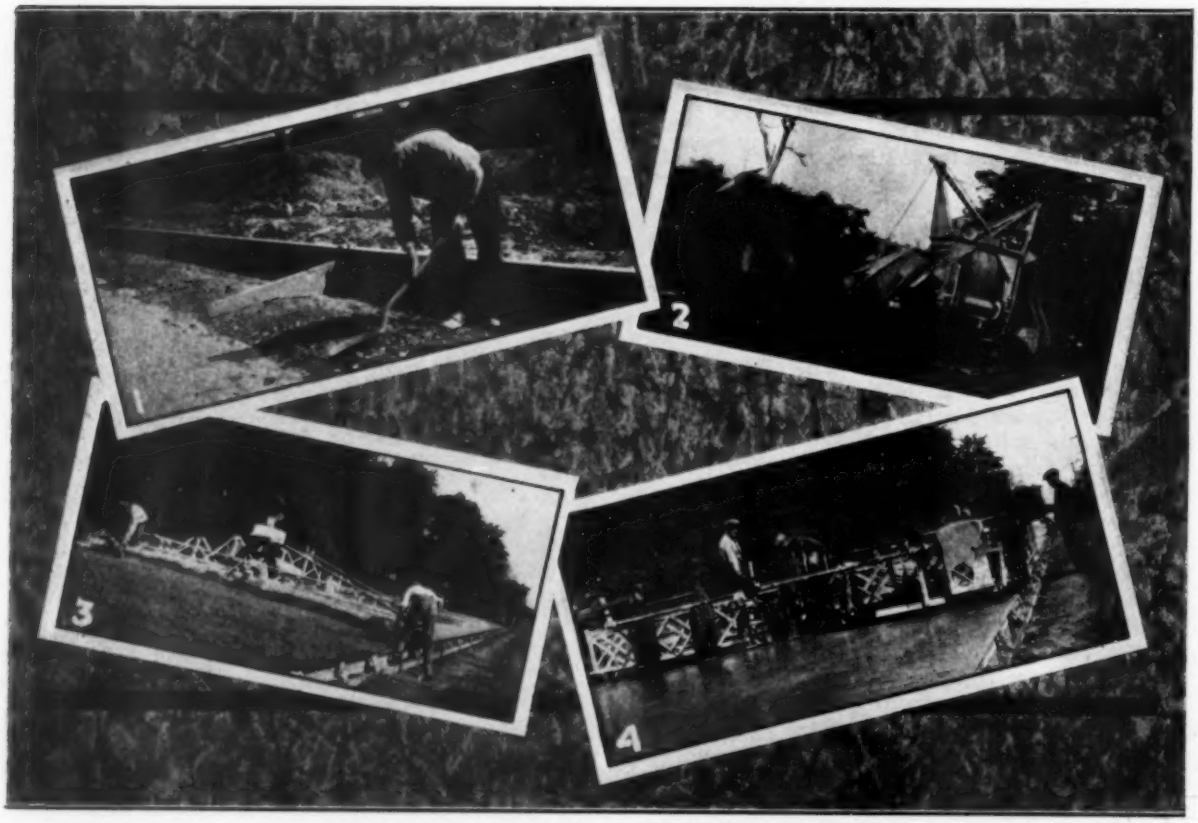
Five men were used back of the mixer for spreading and spading. One man operated the 20-foot Lakewood finisher and two men hand-floated the surface until the water had disappeared from the surface. Two men were used for fine finishing putting an unusually good surface on the slab. These men have been in the employ of the Clements-Orr Co., for several years and are real craftsmen.

The 56-pound mesh welded Truscon reinforcing was laid on the fresh concrete roughly screeded to 4 inches below the surface and then the remaining concrete immediately poured. There was no other reinforcing used.

The concrete was covered with burlap from piles along the side of the road until the following morning when the burlap was removed and carried forward and the 1-day concrete covered with straw and kept wet for nine days. The pavement was opened for traffic in 21 days.

SLAG SHOULDERS

The contract called for 3-foot slag shoulders 9 inches thick, laid in two 4½-inch courses water-bound and



CONCRETING OPERATIONS EAST OF SOLON, OHIO

1. Template for shaping subgrades in earth section alongside the old brick pavement. 2. Autocar dumping batch into skip of MultiFoote paver. 3. Lakewood finishing machine with two men shoveling to the strike-off. 4. Heltzel center joint machine.

COMPLETING THE CENTER JOINT

1. *Pulling channel from the slot.* 2. *The slot remaining after the removal of the channel before hand finishing*

rolled, using No. 2 slag which varies from 2 to 3 inches screen sizes.

DELAYS

This job suffered the same difficulties as practically all Ohio and Pennsylvania projects during the last week of May and the first week of June because of rain. During the week of June 4 it was possible to pour on but one day.

To insure the completion of the job on time in spite of delays due to rain and other unusual causes the batcher plant and the mixer were equipped with electric floodlighting units.

PERSONNEL

The work was carried on under the direction of the State Department of Highways with A. B. Henry, Project Engineer, in charge. Dan Davis was Engineer-Inspector for the State, G. E. Bing, Assistant County Engineer, and Henry Shenk, Inspector, represented Cuyahoga County on this Intercounty Highway Project. Day A. Orr, Vice-President, Clements-Orr Co., was active on the work at all times, and W. D. Mathews acted as Superintendent and Purchasing Agent for the contractor.

Unique Method of Moving Heavy Finishing Machine

THE use of a 30-foot asphaltic concrete raking and finishing machine on the Foothill Boulevard Project, San Bernardino, Calif., is reported by *California Highways and Public Works* to have presented some unusual moving problems. The machine was necessarily heavy as it was specially constructed for raking and finishing the asphaltic concrete surface mixture for the full 30-foot width of the roadway. During its operation, the entire weight of the machine is carried on car wheels running on the side forms as a guide over the track. To secure rigidity in the frame of such a wide machine, it is necessary that the transverse members of the frame be rigid steel trusses. Except by driving by its own power on the 30-foot gage track, moving this machine would appear to be a job for special equipment.

The contractor, Steel Finley, found that the job could easily be done with two of the dump trucks used for hauling the asphaltic mixture from the plant to the highway. Operation No. 1 was to roll the machine by its own power on planks laid temporarily under the wheels to a position parallel to the roadway. When the machine was turned to this position, dump trucks were backed to each end of the machine with the bodies of the trucks raised as when dumping materials. A heavy chain was passed across the rear end of each dump body and fastened to the end of the machine. The dump bodies were then lowered to hauling position. Due to the slightly forward position of the hinges, this caused a raising of the extreme rear end of the dump bodies, thereby lifting the finishing machine from the ground. The remainder of the moving was a matter of team work of the two truck drivers, one driving forward and the other backing, both moving at the same speed. At the end of the move the operation was reversed and the finishing machine returned to its working position across the highway.

The machine was moved a number of times during the progress of the contract. It was first moved from the railroad station to the San Bernardino end of the job. A few days later it was picked up and moved across the Lytle Creek bridge. Later it was moved from Rialto to the westerly end of the contract and later still over an exception at the Pacific Electric Railroad crossing. Finally it was moved back to the railroad yards to be reshipped.

Backing Loaded Trucks to the Dump Is Sometimes Advantageous

ON short haul work, that is, hauls up to 400, 500 or 600 feet, much time can often be saved by shuttling trucks, that is, backing them under load to the dump and driving them forward to the shovel. A skillful truck driver will soon learn to back a truck to the dump almost as easily and accurately as he can drive it forward. The distance over which it pays to shuttle trucks depends on whether the time lost due to slow speed in backing is compensated for by the saving in turning time. In theory there is a wide difference between normal driving speed ahead and in reverse. In practice, the observed backing speed is usually relatively high when compared with the forward hauling speed. Where this is true and the turning time is large, the distance over which shuttling can be done to advantage is considerable.

Shuttling is not resorted to as often as it ought to be nor to as great a distance. On short hauls up to 200 or 300 feet, shuttling the trucks sometimes nearly doubles their output. It also improves operating conditions as where trucks are turning both at the dump and at the shovel, it is hard to manage the trucks so that they will not interfere with each other.

Building 6 Miles of Bituminous Concrete on Cape Cod

Centrally Located Hot Mix Plant Moved from Vineyard Haven to Falmouth Produced 275 Tons per Day

M. F. ROACH & SONS, INC., East Bridgewater, Mass., was awarded the contract for the resurfacing of approximately 6 miles of 24-foot roadway on Route 28 north of Falmouth, Mass. This contractor had been working the previous season in Vineyard Haven using its 1,250-yard Cummer hot mix plant. It was desired to move this plant at once to Falmouth, but because of some difficulties with the local authorities, permission to use the town wharf was withheld. This made it necessary to load the plant on to a lighter from the beach. A new road was constructed to the beach and four trucks and a Fordson tractor were used to haul the plant down to the beach. The lighter was run in at high tide and anchored and cribbing was built out to it from the shore and planked. After the plant had been loaded, it was found that the lighter had been run in too close as the added weight of the plant caused the lighter to rest on the beach.

To work the lighter off shore three anchors were put out, one aft and to starboard, one aft and to port, and one directly astern. By running the cable over the niggerhead on the lighter and pulling first to one side and then to the other in about an hour the lighter was pulled off and floated. No difficulties were experienced in landing the lighter quite close to the job and hauling it over the road which was to be rebuilt, to its location at an exceptionally large and well-graded sand pit at West Falmouth.

About 30 per cent of this project was on relocation,

Four Trucks and One Fordson Tractor Pulling the Cummer Asphalt Plant Along the Road in Vineyard Haven to the Beach for Transportation on a Lighter to the Mainland

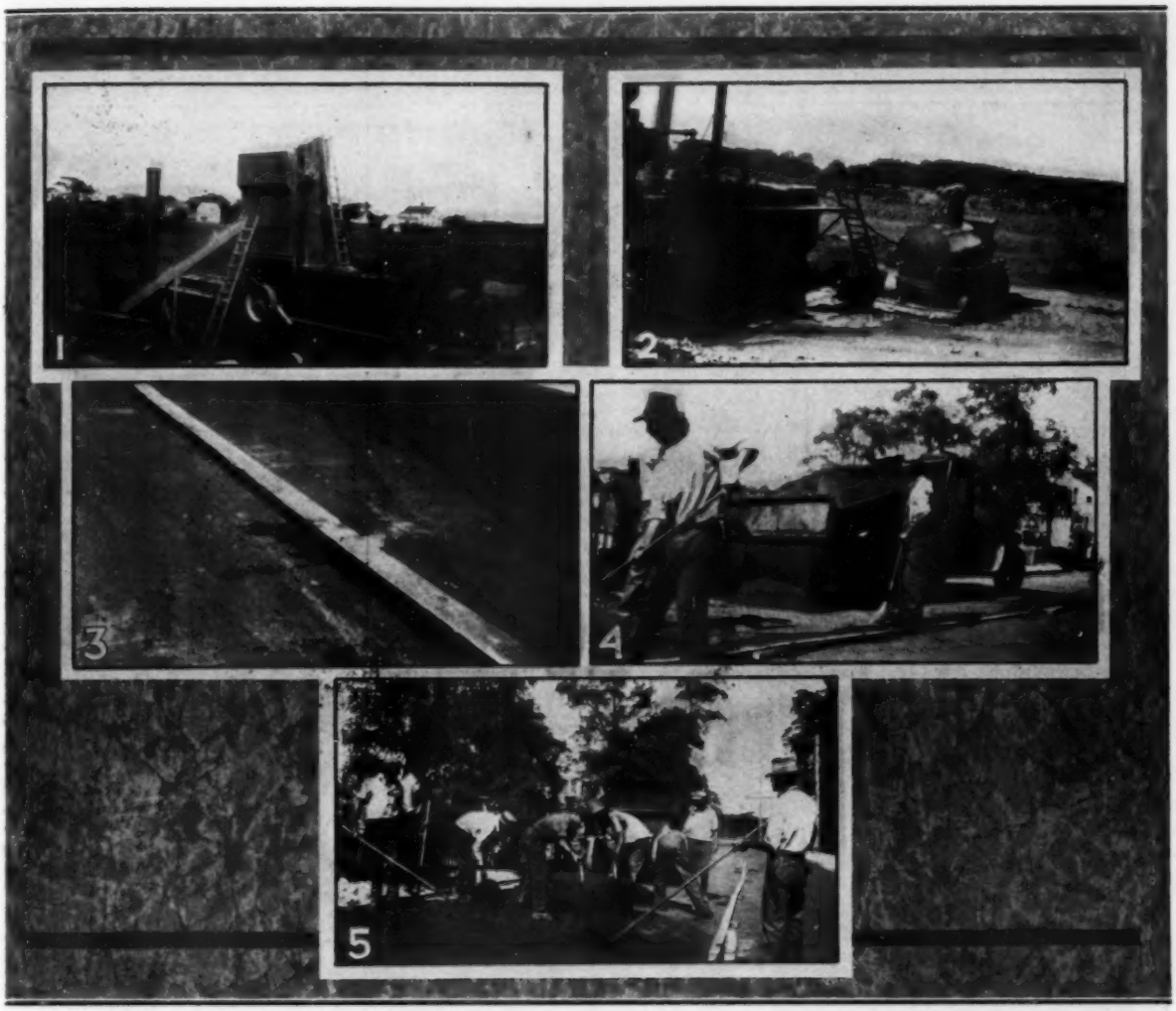
which involved about 45,000 yards of ballast cut and fill. On the relocation a gravel subbase was laid with the same Type A bituminous concrete top.

Layout of Plant

The hot mix asphaltic concrete for this job was made up in 900-pound batches with 30 per cent screenings, 64 per cent sand and 6 per cent asphalt. The screenings were trap rock stone dust from the New Haven Trap Rock Co. quarries. This was delivered by rail to a siding about two miles from the plant and trucked by hired trucks to a stock pile adjacent to the Cummer plant. Sand was moved from this pit down grade by three 2-horse scoops, and both the screenings and sand conveyed to the dryer by bucket elevators. Oversize stone amounted to about 6 yards a day, which was hauled away in 2-yard wagons and used for fill along the shoulders of the job.

The Socony asphalt was hauled in by 800-gallon trucks from a railroad siding about four miles distant and pumped by the truck into the 2,000-gallon tank located at the opposite end from the sand and screening

End of a Long Fill on New Location at Left and an Erie B-2 Shovel Widening the Grade



HOT MIX PLANT AND WORK ON ROAD

1. Cummer 1,250-yard asphalt plant with bucket elevators for screenings and sand at right and wagon for oversize stone at left. 2. Socony asphalt truck pumping asphalt into 2,000-gallon storage tank.. 3. Forms of 2 x 4 lumber held by railroad spike and block at joint. 4. Graham Brothers' truck with Wood hydraulic hoist dumping hot mix. 5. Shoveling and raking hot mix prior to rolling.

bucket elevators. Here the asphalt was heated to the proper temperature and raised by air lift to the pug mixer. The sand dryer of this plant uses fuel oil while the boiler and asphalt kettle are heated by coal.

The plant started operations on July 27 and operated until the middle of October, when the resurfacing was completed.

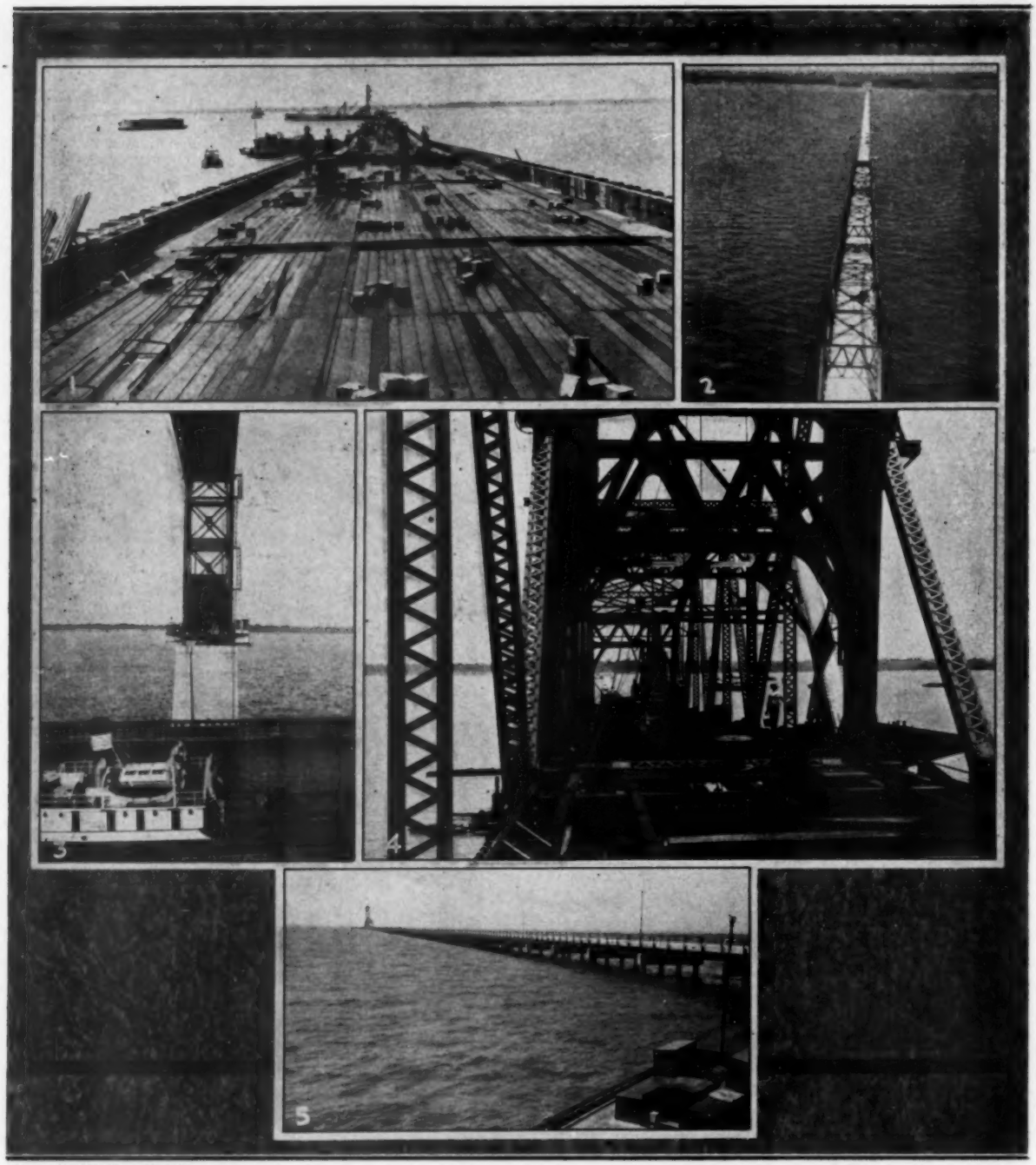
Placing the Mix

Six 900-pound batches were loaded per truck and hauled a maximum of 6½ miles and a minimum of ½-mile to the road. The United States Bureau of Public Roads made time studies on this plant during a large part of the operations.

The road was resurfaced one-half at a time in order to maintain traffic over this heavily-traveled highway which leads to many of the Buzzards Bay and Cape Cod shore resorts. The work was done in 12-foot strips between forms of 2 x 4's laid flat. The trucks backed up to position and dumped the hot mix in piles of about 1½ cubic yards each and all of the piles were shoveled to the end of the freshly laid strip, raked and rolled. The surfacing gang usually consisted of four men shoveling and three men raking. The average production of the plant was 275 tons per day and the average 12-foot strip laid was from 1,500 to 2,000 feet. The hot-mix top was rolled within an average of 30 minutes after placing by a Buffalo-Springfield tandem gas roller.

Personnel

M. F. Roach was Superintendent on this job, with A. J. Roy, Superintendent of the hot mix plant. The work was done under the supervision of L. R. Sellew, Senior Civil Engineer, Massachusetts Department of Public Works from the District Engineer's office at Middleboro, with H. E. Warren, Junior Civil Engineer, acting as Resident Engineer.



Photos by Hamilton Wright

NEWPORT NEWS-JAMES RIVER BRIDGE TO BE OPENED NOVEMBER 17, 1928

The Newport News-James River Bridge is one of three which are being rushed to completion to afford direct highway connection between Newport News and the Norfolk and Portsmouth districts in Virginia. The bridge is over four and a half miles long, and has a 300-foot span with a lift of 150 feet. The foundations extend over 100 feet below the water, and the greatest height of the lift towers is 200 feet. The bridge is of the trestle bent type, supported on groups of four concrete piles spaced 44 feet apart. The piles are capped with molded concrete caps, and between these are set four lengths of 30-inch I-beams to carry the roadways, which are 23 feet wide between curbs and 9 inches thick. The illustrations above show: 1. Pouring the deck slab from the floating concrete mixer seen in the background. 2. The eastern end of the structure as seen from one of the lift towers. 3. The 300-foot lift span raised showing a small steamer passing through. 4. Looking north from a point on the lift span, showing the creosoted timber flooring in the foreground, the lift span in the middle ground and the concrete trestle to the north shore in the extreme background. 5. Bird's-eye view of the bridge, showing some of the 115-foot precast concrete piles, weighing 35 tons each. These were driven four at a time by the only 4-lead pile driver in use today.

The Myth of the Winter Slump

By A. Bill Derr

THE time when winter meant only one thing—an enforced vacation—is within the memory of all of us. Without stopping to consider whether or not the winter let-down really was "enforced" and inevitable, the first flurry of snow saw us hurrying to complete the jobs on hand, laying off men and stowing our equipment away for three or four months.

We know now that we were the victims of a habit or a tradition. The simplest way to illustrate how firm a grip this habit had on us is simply to point to the fact that the coming of winter meant slack time in the building trades in the South and on the Coast, where winter temperatures are mild, as well as in the North. We took it for granted that from Thanksgiving to April Fool's Day building was "out of order."

How Did the Slump Start?

The origin of this practice is obvious enough. The early building habits of this country were formed in the North, where winter means a good deal of cold, frozen ground, snow, ice and slush. At the time we were forming this habit, we had no tools for overcoming the difficulties imposed on us by winter; so we knocked off work. And by the time we had developed tools to enable us to carry on in winter, the habit was so strongly fixed that we were slow in putting our winter equipment to work.

And now, when we know perfectly well how to do winter work, how to carry on just as successfully as in the conventional "building season," our old habit has passed on to the public. The average man still believes that winter construction is either impossible or unsatisfactory, and governs himself accordingly. He holds off his own building projects until spring. And we have to put up with the situation. At least, some of us think we have to put up with it.

A full technical discussion of winter construction methods is not necessary. You know as well as we do that we have nothing to lose and everything to gain by following the few simple rules which govern our work during the cold months. We have the means at our disposal to explode the notion that concrete work, for example, cannot be successfully done in winter. We know what it means to lay off the staffs we have carefully built up, to store our equipment where it earns nothing and lives on a steady diet of over-head. And most of us know what winter means in terms of our own bank accounts.

Education Needed

We have, it seems to me, only one reasonable plan of campaign. It is summed up in the one word, education. We must educate individuals, corporations, civic organizations and larger governmental units in the fundamental truths of winter construction. We must prove, for example, that we can put up a first class concrete job in zero weather at almost negligible additional costs. We can prove that these extra expenses, necessary in heating the concrete aggregates and the water and in protecting the green concrete, are automatically offset by the earlier earning power of the building, by the lessening of the interest-paying period on borrowed funds tied up in building operations, by the great savings effected by early completion of improvements—and so on.

Labor Available

There is the labor aspect of the situation. Under the old scheme, with labor expecting to work only three-quarters of a year, wages for that period had to include sufficient extra to tide the worker over the slack times. At least, that was the theory. We know that most labor is, like ourselves, human; money in hand is money to spend. The result has been that late winter has witnessed extreme poverty on the part of many workers. Some of them found other kind of employment, of course, but the increasing stringency of union regulations makes it difficult for a man to have more than one trade. Consequently, the workman welcomes winter operations, at regular wages, minus the bonus which is common during the conventional spring peak building season.

What is the significance of this for us? It means that we have the cream of labor to choose from. Labor is abundant. We do not have to take anybody we can get. And it is only natural that a man works better if he knows that there are men waiting and watching for a chance at the same job. Add to that the inescapable fact that a man tends more strictly to business on a cold day than on a hot, sultry day.

The Supply Market

The situation in regard to labor is reflected, more or less accurately, in the building supply market. Raw materials and manufactured articles experience a slack in demand in winter. Prices automatically fall. And the man who has a winter job benefits.

Building Is a Key Industry

The building industry is one of the key industries of the country. As it prospers, so prosper countless other groups, directly or indirectly allied to and dependent upon it. As it lapses into inactivity, these other groups suffer. It is to the best interests of practically every enterprise to have the winter slump in construction eliminated. Every business man knows it; it is our greatest asset in the campaign of education which, in my belief, we must undertake.

Some far-seeing gentleman may ask, "Suppose we eliminate the winter decline in business; suppose the whole year sees us working to capacity? Will we not then lose the advantages which the present season of

low prices affords?" Of course we shall. But we shall have gained far more. It is to our best interests that there should be no seasonal falling off in our work. And we have definite knowledge that it is also to the advantage of the man who wants to build, to the stockholder in an enterprise, to the working man and to the public at large.

INDIVIDUAL CAMPAIGNS

The means at our disposal for conducting a campaign of education in regard to winter construction are many. First and best is a direct presentation of the facts to prospective builders. Show the man who intends to build a home that, by starting in the fall, he can be rid of the rent collecting landlord by spring. Show the prospective builder of a large apartment or an office building that the sooner he gets his building in operation, just that much more quickly will it begin to make a return on the money he has invested in it. Show our government that needed improvements can be begun, regardless of the season, to the advantage of the whole community. Cite the example of Philadelphia, where huge and magnificent schools have been started during the cold months, with complete satisfaction and to the benefit of the children of the city.

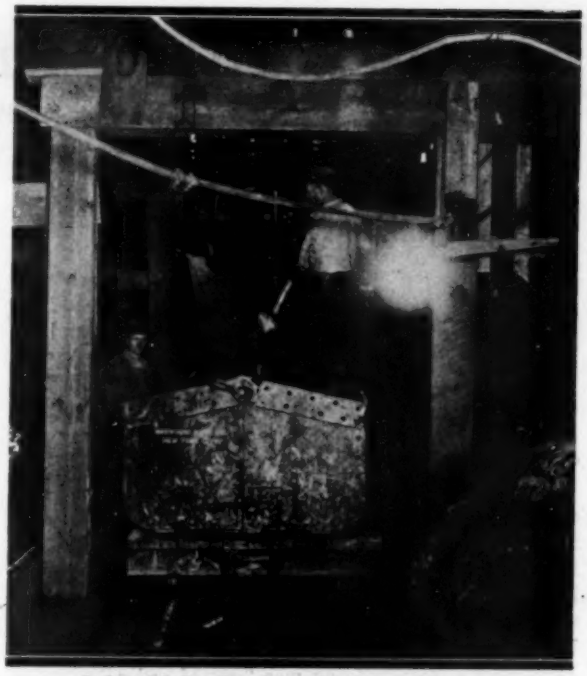
Our newspapers will help us. Give them news of any winter construction you may have ahead. Stress the fact that, armed with salamanders, canvas and a coil or two of steam, you have no reason to fear the winter. Your building will rise, complete in strength, fully equipped to fulfill its purpose.

Once we have begun our campaign, it will automatically carry itself along. If, this winter, there are a number of first class building operations going on in your community, the public will be able to see, at first hand, that the myth of the winter-building lapse has been exploded.

On an inside page of a certain New York newspaper there appeared, on May 21, an article by an "authority" who showed conclusively that man could not possibly fly from New York to Paris. On the front page of that same paper there appeared the bulletin of Colonel Lindbergh's magnificent landing at Le Bourget.

Another "can't-do-it" myth had been ruined. We, by less spectacular means, can demolish the myth which has robbed us of a full year's work and a full year's reward.

An 18-Inch by 21-Foot Barber-Greene Conveyor Operating in Close Quarters Loading Subway Excavation



Industrial Car Receiving Spoil from Conveyor

Subway Excavation With Portable Belt Conveyors

BELT conveyors provide one of the cheapest ways to excavate where conditions permit their use. The Arthur A. Johnson Corp., New York City, is using seven portable belt conveyors under most unfavorable conditions in building a subway in Long Island City, New York. The subway is located directly under one of the main streets. Using four Barber-Greene belt conveyors in one shaft, with 18 men, it has been possible to remove over 1,800 cubic yards per 48-hour week.

The first 6 or 7 feet directly under the street surface is a tangled mass of water and gas lines, sewers, house connections, telephone and light wire cables, all of which must remain undisturbed during construction. These conditions make the work of excavation very difficult. To make the job even more difficult surface street cars run on a track located in the street just above the excavation. The soil is a sandy loam which can be handled very satisfactorily both by hand shoveling and on belt conveyors.

It was decided to use narrow gage dump cars to haul out from the excavation. The street car track is supported on special steel work while the water pipes, sewers, conduits, gas mains, etc., are all supported by timber work. With all these temporary supports, the available headroom was cut down to approximately 8 feet. It was found that a portable belt conveyor mounted on a special truck with a narrow gage axle permitted the speedy loading of the dump cars with the low headroom. The conveyor, after a short trial, proved to be the best link to fill the gap between the shovelers and the dump cars.

On April 13, 1928, the Arthur A. Johnson Corp., bought the first conveyor unit, a Barber-Greene 24-foot x 18-inch plain belt conveyor with electric motor. On May 14, a duplicate of the first conveyor was purchased. On May 31, three 21-foot by 18-inch machines were added and on June 2, two 30-foot by 18-inch conveyors were installed. The cost of getting dirt into the hoppers at the head of the shaft for dumping into trucks runs about 72 cents per yard, and for hardpan with some boulders, as high as $2.92.

The Largest Grading Project in Indiana

By C. S. McKee

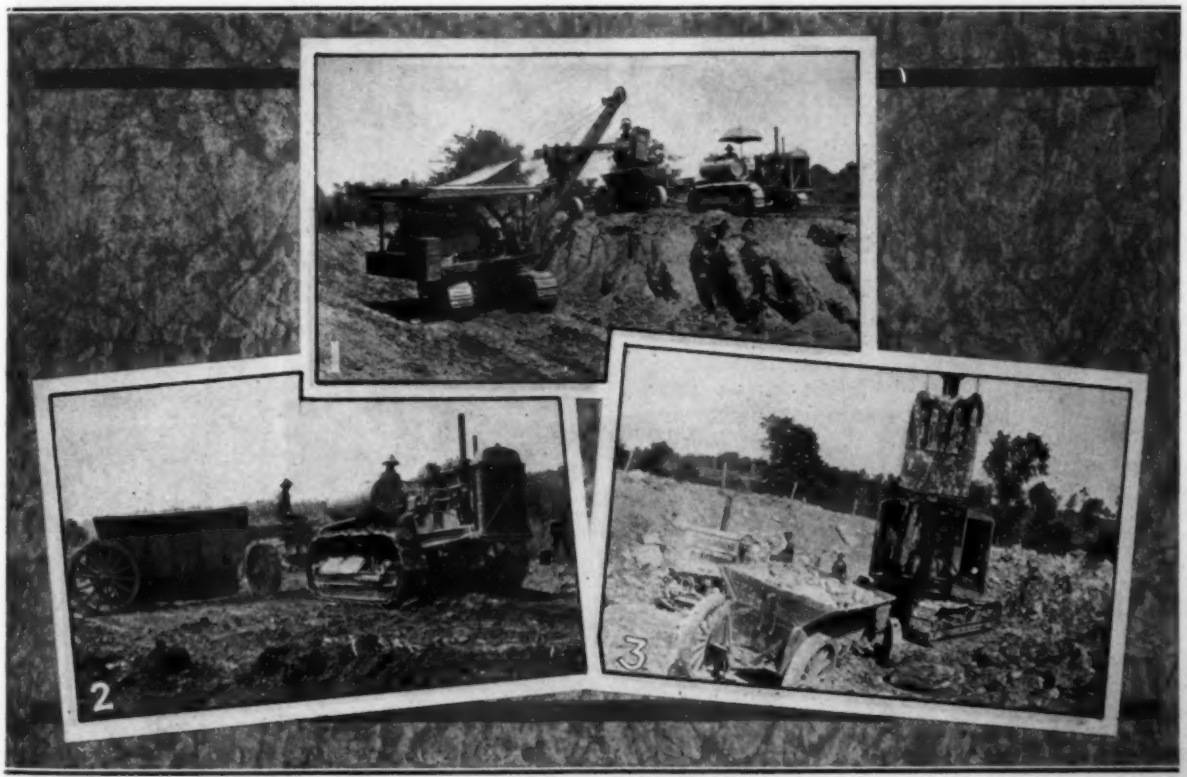
Field Engineer, Indiana State Highway Commission, Bloomington, Ind.

THE largest grading project now under construction in the State of Indiana is on Federal Road No. 37, between Bedford and Bloomington. Road 37 runs through the middle of the Bedford building stone country. This country with its steep high hills and deep ravines presents numerous difficulties to the design and construction of a road. In order to hold to the standard of a maximum grade of seven per cent and a maximum curve of ten degrees many deep cuts and high fills are required. Seventy-five per cent of the new road is relocation. To be sure that the work would be completed in one season the road has been divided into four sections. Only the grading on the relocation in three sections is under contract for this season. The estimated yardage under contract amounts to 232,000 yards of which approximately one-fourth is rock. The grading in the old road will be done by the paving contractor.

The standards for this work show a 36-foot roadway between ditches in an earth cut and a 32-foot roadway in a rock cut. The exact depth at which rock would be encountered was not determined by the survey, except in a few places, so that the exact amount of excavaton cannot be determined until the cut is started and the rock located. Where it is not known at what depth rock will be encountered the cut is started as if it were all earth, and when rock is reached the cut is narrowed to the rock standard. This leaves a ledge between the top of the rock cut and the toe of the earth slope which keeps the earth from continually falling into the ditch.

Handling Boulders

The rock is of varying hardness and lays in varying formations. In most cases the cut does not go to the solid ledge so that all that is found lays in a loose seamy formation or is just a series of large boulders often with various sized earth seams between. The shovel can move the loose seamy rock without much trouble but moving the boulders is not so easy. After all the earth and seamy rock has been removed all of the boulders that can be located are drilled and shot. The rest have to be shot when the shovels runs into them. In all the shallow



GRADING OPERATIONS ON SECTION B

1. *Northwest shovel loading one of the trains of 6-yard wagons.* 2. *Caterpillar Sixty and dump wagon on fill.* 3. *Tractor and dump wagon making a sharp turn under the shovel for loading rock*

rock cuts the shooting is done by a 50-shot battery. Only twenty-five or thirty holes are shot at a time. In the deeper cuts the whole cut is shot at once by using cordeau.

HILLSIDE FILLS

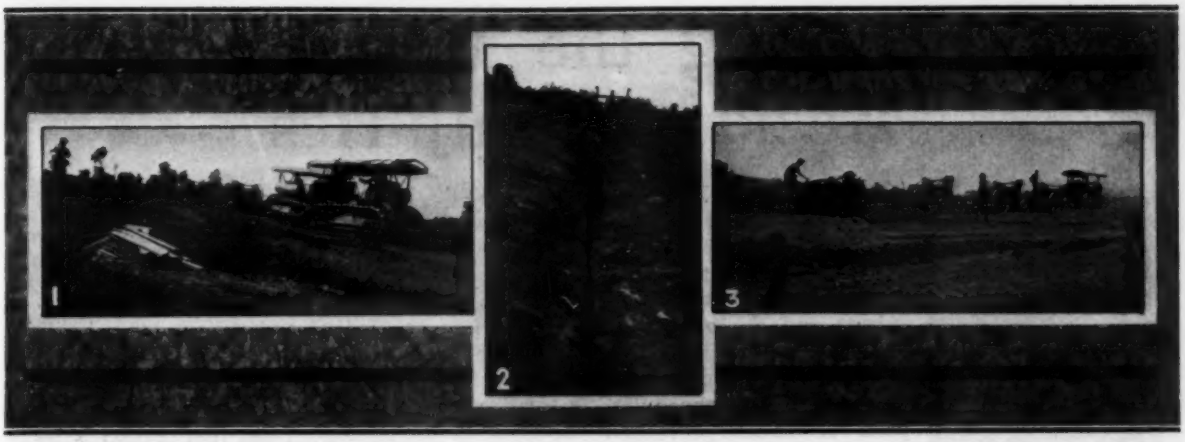
Where fills are placed on steep hillsides there is much danger that they will slide. On this job,wherever there is a fill to be placed on a steep hillside, the earth under the fill is thoroughly plowed up or trenched, and if the rock is not far underneath and has a slope with the hill, trenches are blown into the rock lengthwise with the road but at such an angle that the water running over the surface of the rock will be drained from under the fill, thus doing away with the greasing effect that causes most of the slides.

EXCAVATION ON SECTION B

In each of the three sections a different method is used to handle the excavation. In Section B two Northwest gasoline shovels with 1-yard dippers are used for loading, and four Caterpillar Sixty tractors, each with two 6-yard bottom-dump wagons, haul the material away. The fill is kept in shape by a Caterpillar Thirty tractor equipped with a bulldozer. One shovel and two tractors strip the earth off the rock and the other shovel moves the rock and does the trimming. If the front shovel gets too far ahead it is started back in one of

GRADING AND DRAINAGE OPERATION ON SECTION C

1. Construction of 3- x 3-foot concrete box culvert. The grade at the lower end is about 27 per cent and at the upper end 20 per cent. 2. Grading on section handled by Maneys. 3. Loading rock with a Northwest shovel. 4. A rock cut showing the ledge between the top of the rock cut and the top of the earth slope at the right. 5. Two spans of a 3-arch bridge over a railroad being built under a separate contract by Wasnidge and Lenard. 6. A strip of roadway on Section C almost completed.



Baker-Maneys Working on Section D and the Channeling Machine Making the Protective Trench Prior to Blasting Near Limestone Quarry

the rock cuts so that at all times the two shovels are within 2,000 feet of each other. Two 5½- x 5-inch Ingersoll-Rand compressors and one Schramm of the same size, each operating one hammer, were used in drilling.

MATERIAL HANDLING ON SECTION C

Section C has the smallest yardage under contract due to the fact that over half of it follows the old road. There is also an Exception to the grading contract here because of two bridges which are under separate contract. As soon as the bridges are completed, a contract will be let to complete the grading through the Exception. The estimated yardage is about 70,000 and the distance about one-half mile. The part under contract is over half rock and has some of the largest fills. The earth was moved by sub-contract. A Baker-Maney outfit, consisting of two Caterpillar Sixty tractors, each pulling from three to five Maneys, moved from 400 to 800 yards a day. Cleaning earth from the rock was rather slow work with this equipment because the surface of the rock was very uneven. The cuts in the rock were much deeper than in the other sections. An Ingersoll-Rand compressor operating two hammers was used to do the drilling. In some cases the cuts were made in two lifts. The top boulders were taken out and then the solid ledge was much easier to drill and shoot. A ⅞-yard Northwest gasoline shovel and from three to six 5-yard Auto-Car trucks are used to move the rock. The haul in most places is short so that the trucks back from the shovel to the fill.

PROTECTION OF BUILDING-STONE QUARRIES

In Section D the earth is being moved by the Baker-Maneys. One of the Northwest shovels with its tractors and wagons will move the rock. There is one interesting thing being done in this section. There is a cut of 10 feet to be made in a deposit of Bedford building stone, and the company that owns this deposit is cutting a channel two inches wide the full length of the cut and two feet below grade, so that, when the blasting is done, the cracks will not extend through the ledge and ruin the deposit for building purposes.

PERSONNEL

The John J. Quinn Co., Inc., of Bedford, Ind., and Miami, Fla., was the contractor for Sections B and D, and I. D. Clark Co., of Indianapolis, Ind., was the contractor for Section C. The contractor on the 3-arch bridge was Wasnidge and Lenard, of Jasonville, Ind. T. W. Garrison was State Engineer on Section B, A. J. Kinney on Section C and Clair Shields on Section D.

Time Losses When Trucks Are Used in Highway Grading

TRUCKS must generally be turned around twice with each load carried in highway grading except on some short haul work. This takes time because under most ordinary conditions, some backing is required. The roadway width varies a great deal in different states. A width of about 30 feet is perhaps the most common, but it is not unusual to have a width of several feet more or several feet less. Thirty feet of width is sufficient for quick turning if it can all be used. Usually a strip of some five feet along the edge of the dump is so soft that it will hardly carry the weight of an empty truck. The usable area is often so restricted that the truck has to pull forward and back a number of times before it can complete the turn. In a through cut the condition is not apt to be so bad, but even here it is seldom possible to make the turn without some backing.

With the heavier vehicles the total time required for turning and spotting to receive and dump the load during each round trip is rarely less than 75 seconds and may under adverse conditions exceed three minutes. Where the operating space is restricted, trucks with a short wheel base have a definite advantage and save much time as there is not the need for as much backing and cutting.

With rear wheel drive it is often impossible to take full advantage of the minimum radius on which a truck will turn and this is especially true where ground conditions are bad and the vehicle will stall if the front wheels are cut the maximum amount. For this reason it is not to be expected that a truck will turn on as short a radius under the conditions commonly prevailing on a construction job as it will turn on an improved highway.

Backing frequently increases the lost time constant. The backing speed of most trucks is relatively low. In spite of this handicap trucks are quite often backed a much greater distance than is necessary in getting to position at the shovel and are often backed into position at the dump. Some backing may be desirable. It has been pointed out that sufficient attention is seldom given to spotting the trucks at the shovel so as to take advantage of the greater production which is possible when loading at the side inside or behind the shovel. This should be taken into consideration when laying out the job.

Minimizing the Damage of Accidental Injuries

By F. H. Westmeyer

Insurance Manager, The A. Bentley & Sons Co., Toledo, O.

THERE is a very close relation between the prevention of accidents and the minimizing of losses resulting from accidents, because efforts in either direction have a common purpose. If accident prevention was wholly successful, there would, of course, be no need of discussing the means of caring for the injured.

Construction Is Hazardous

Accidents still occur and a great many men are still being injured. In the state of Ohio alone, the number of injured for the first half of this year exceeded *one hundred thousand*. In the construction industry, particularly, the frequency rate is high. It is not especially difficult to understand why this is so. The reason lies largely in the fact that there are more hazards in the construction industry than in other industries. You can get some idea of the relation of hazards in construction to industrial hazards generally from this—the workmens compensation rate manual of the Ohio Industrial Commission, which does not vary greatly in its classification list from the rate manual used by private insurance carriers, lists 590 occupations or classes of hazards. Of this number, 78, which is more than one eighth of the total, are distinctly contracting operations, and 51 more are allied classes of work which are, in some few instances at least, carried on by contractors.

All these hazards; a large labor turnover; seasonal occupation; continually changing physical conditions at work that is under way; and various other conditions peculiar to the construction industry are all obstacles to successful prevention work. These obstacles, serious and discouraging as they are, should not deter us from prevention efforts, rather they should spur us on to greater efforts; but as long as men are injured, it will be necessary to care for them and to limit as far as possible the extent of the damage resulting from their injuries.

Loss of Productive Capacity

Now, what is the damage, what is the loss which results from personal injuries? Disregarding here the pain, suffering and anguish caused, because these are items which cannot be considered economically, although they should always be kept in mind, there are quite a number of items which go to make up this loss. The most important of these are the immediate loss of productive capacity of the individual injured, through loss of time immediately following the injury, and the lessening of that productive capacity, through any impairment of bodily function which may result from injury. In addition, the cost of supervising the care of injured, fees for medical and various other kinds of service, hospital and nursing costs and various lesser items must be considered. The various workmen's compensation laws provide what portion of this loss shall be borne by the employers, and that portion is borne either directly by self insurance, or by a great many employers, collectively, through the medium of insurance with privately or publicly conducted workmen's compensation insurance companies or funds. Keep in mind, always, the cold, hard fact that insurance companies or funds bear no portion of this loss; that they merely act as administrators in the distribution of it, always collecting, or at least endeavoring to collect, a respectable fee for their service.

Care of Injured

To attempt to set forth specific rules for the care of injured and to expect such rules to fit all cases would be a useless effort. Above all other things, it is necessary to adopt the mental attitude of putting yourself in the place of the injured man and, prompted by that attitude, to do for him, as far as possible, the things you would like to have done if you were in his place. This advice loses nothing either in value or practicability because it happens to be the oft repeated general advice given some nineteen hundred years ago by the greatest philosopher of all times. Amplifying this, there are certain sound, fundamental practices which may be applied, with sundry changes in detail, to all cases, and these practices will be discussed here, not in the order of their importance, but in the order of their need or occurrence.

First—The acceptance of the idea that accidents will occur. This item is probably the most important of all, because if it is not a part of your scheme of management, it quite naturally follows that no plan for the care of injured will be made until an injury is actually sustained. Caring for injured, like any other human activity, proceeds more smoothly and with less error if this work is planned in advance of its execution.

Second—The centering of responsibility for the care of all injured in some one person and the making of some provision, as nearly perfect as possible, for the prompt reporting of all accidents to this person. A reasonable measure of authority must, of course, go with this responsibility.

Third—The selection of certain definite agencies for the repair of the damage wrought by accidents. This should include the selection of a doctor or doctors, X-ray man, ambulance and hospital. Having made a selection, your field force should be kept fully informed as to just what agencies are used. Arrangements should

be perfected for the making of quick contacts with these agencies, and these arrangements should provide for substitutions when for any reason such contacts cannot be quickly made when needed. An injured man does not feel any better in mind or body, if he is compelled to wait, without proper attention, while those around him are wondering what to do next.

Fourth—The presentation to your field force and the acceptance by that force of the idea that when an accident has caused a disabling personal injury, the most important piece of business at hand is the care of the injured person. Common decency suggests this, but quite aside from any humanitarian reason for promptly and properly caring for disabled persons, there is the fact that all serious accidents cause disorganization; and reorganization will not take place until the injured is removed from the scene of the accident if he is disabled.

Fifth—Maintaining a genuine interest in the physical welfare of the injured employee, allowing him to know that you have this interest.

Sixth—The exercise of great care in the selection of the agencies used for the care and treatment of injured. Only thoroughly competent physicians and surgeons, preferably those specializing in industrial work, should be used. If you were injured and were unwilling to have your own case handled by the doctor whom you select for the treatment of your injured employee he is, by that token, not good enough to treat an injured employee.

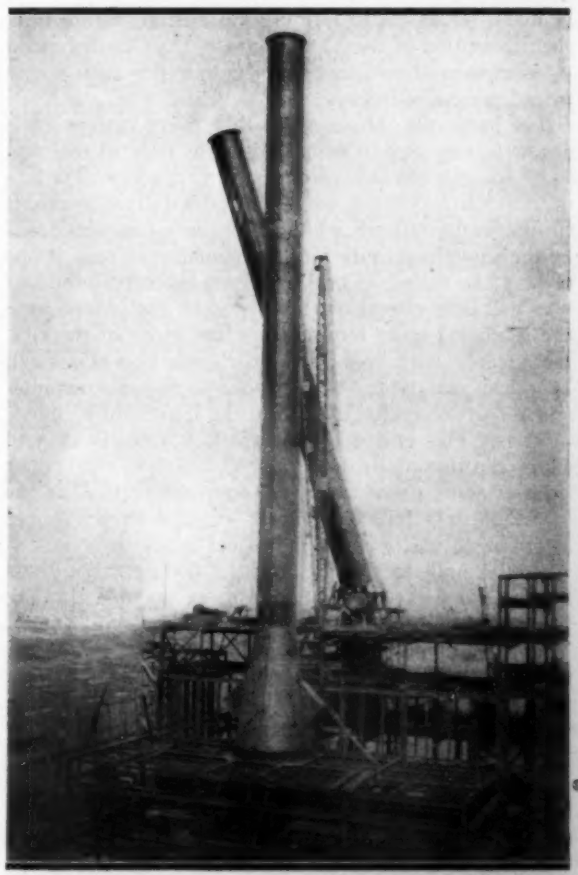
Seventh—Close cooperation between doctors and employers. This applies as well to agencies of repair other than doctors. You should be advised at frequent intervals as to the physical condition of any injured employee whose injury is at all serious, and the doctor should receive the support and influence of the employer in any measure intended for the good of the injured employee. There is an idea, prevalent in the minds of a great many people that, once a man is injured, the whole responsibility for him until his return to work should be passed on to his doctor, and that any attention to him on the part of anyone else is an almost sacrilegious infringement on the rights of the injured person or the prerogatives of the medical profession. This idea, which does a great deal of harm is, fortunately, not held by any great portion of the medical fraternity.

Eighth—An understanding, in a broad sense, of the purpose of workmen's compensation laws in general and a specific, detailed knowledge of the workmen's compensation law which is applicable to the particular work being carried on by you. Where the liability imposed by the workmen's compensation law is passed on to an insurance company, this does not relieve the employer of all moral obligation. It is essential that all injuries be promptly reported to the insurance carrier and it is equally important that the injured person receive, without any undue annoyance or delay, any workmen's compensation benefit due him and no more. Keeping compensation payments within the legal limitations applies only to compensation for wage losses, for there are a great many instances where it is economical to disregard entirely the legal limitations for medical and hospital service and to go far beyond those limitations. It is unfortunate, indeed, that the present practice of insurance carriers generally, including state funds, is such that losses which might be curtailed by certain early attentions, possible only through close contacts with injured persons and the agencies of repair, are permitted to get out of bounds because of the inevitable delays always incident to remote control.

All of the practices outlined are viewed from the standpoint of the employer and it is entirely proper that they should be, because under the modern concept of responsibility for industrial accidents, the employer is held wholly responsible and he should, therefore, not be barred from using any available means for reducing the losses from accidents, so long as the means employed do not definitely work to the harm or ultimate damage of the injured employee.

THE DIRECT COST OF ACCIDENTAL INJURIES

It is very difficult, if not impossible, to point out in minute detail just how the damage is minimized in any particular case or to show just where some saving is effected. There is a way of knowing, however, whether or not reductions are being effected. Records can and should be kept showing the direct cost of accidental injuries. These records should show not only the cost in money expended for supervision, medical, hospital and other service and workmen's compensation benefits to injured employees, but the time loss as well. The loss



Erecting a 113-Foot Steel Stack Weighing 22 Tons, a Ticklish Job Requiring Attention to Safety at Each Step

in money, considered apart from the loss in time, and the loss in time, considered apart from the loss in money, should be set against the total number of hours worked during any given period. In this way, *relative* costs may be established and comparisons made. Another method is to keep a cumulative record of the employer's whole cost of accidental injuries and a cumulative record of all payroll expenditures and compare the cost figure with the payroll figure. This method is faulty, as will be explained in a moment, but it is the only method by which workmen's compensation loss costs can be compared with workmen's compensation insurance costs. The method used by insurance carriers for measuring workmen's compensation loss experience and for fixing premium rates is to take the payroll of the employer as a basis, using each one hundred dollars of payroll as a unit of measurement. This method is wholly unreliable, because of changes in wage levels between one period and another or between one locality and another, and it should not be used if loss experience records are desired in such form that the record for one locality or for one period of time may be compared with the record for another locality or for another period of time.

A Generalized Accident Case

So many petty details enter into the proper handling of accidents and employees' workmen's compensation claims that a great deal more of a detailed nature might be said, but time is not available for that purpose. It is, moreover, easier to form a good mental picture from the description of some specific case, than from general rules or suggestions, so we will now follow such a case from the time of injury.

The particular job on which this injury is to occur is a new factory building, located at the edge of the city, some six or seven miles from your main office. The site of the job is visited before a spade-full of earth is turned, and you learn while going there just which will be the smoothest route for an ambulance to take if one needs to be called. Charlie Stelker, the superintendent who will have charge of this job, is on the ground and, the job being quite remote from the center of the city, you arrange with him for the early erection of a small but clean shanty for the keeping of first aid supplies and for the reception of men in the treatment of minor injuries. This is done because it is less costly than to suffer the loss of time occasioned by men with minor injuries going down town for treatment or to take the inevitable loss following failure of men to get proper attention to nail wounds and other lesser injuries.

You explain to Charlie that the doctor will call on him at the site of the job, at any reasonable time, to arrange with him the details for attending to minor injuries, and you ask him to make his own appointment with the doctor. Again you tell this superintendent that no injury may be regarded as trivial, although you have told him this same thing some twenty or thirty times before. He already knows what doctor will attend the injured, what ambulance will be used and to what hospital disabled men are to be sent. You remind him that as soon as his first aid shanty is up it should contain, in addition to ordinary first aid supplies, one or two stretchers or cots, and that the doctor may recommend some additional equipment. If you have not already talked with Doctors Post and Crane about this particular job, you do so without further delay and ask them to make such arrangements with Charlie Stelker, for the treatment of minor injuries, as will be mutually satisfactory. Possibly, you will make some special fee arrangement for service at this particular job.

The Accident Occurs

Two or three months later your telephone rings and Jim Gridley, the timekeeper at this job, tells you that an employee, named Dave Bendel, has just fallen and appears to be quite seriously hurt. You ask whether Bendel is bleeding and, being assured that he is not, you learn that he has been picked up and placed in a fairly comfortable position. You may ask whether Bendel is conscious and whether the nature of his more serious injuries is quite evident, but you spend no time now asking about the accident. You already know that the accident has just occurred and you learn that no ambulance has been ordered. You tell Gridley that you will order the ambulance, that a man should be stationed at the entrance to the plant premises to direct the ambulance driver when he arrives, and that the ambulance driver should be directed to take Bendel to St. Vincent's Hospital.

You then order the ambulance by telephone, being careful to learn that one is actually available immediately and, when giving your order, state that Bendel should be taken to St. Vincent's Hospital. You may make some suggestions as to the most direct route to the job and the smoothest route from the job. Then you try to get into communication with one of your doctors at the office of Doctors Post and Crane. If the accident occurs in the forenoon, you will probably not locate either doctor there, but as they do much industrial work they are accustomed to receiving emergency calls and have their affairs so arranged that their office attendant can probably locate one of them with almost no delay and, after telling her that a patient, Bendel, seriously injured, is on his way to St. Vincent's Hospital, you enlist her services in locating either Dr. Post or Dr. Crane, requesting her to advise you definitely within a few minutes whether or not she has been successful. You then call St. Vincent's Hospital and arrange for the reception of the patient, learning at the same time whether or not either Dr. Post or Dr. Crane is there. If either is at the hospital, you ask to have him immediately located and sent to the emergency dressing room where the patient will be received. After doing these things, you will probably not have to wait more than two or three minutes before you hear from the doctors' office attendant. If she has not been able to locate one of them, you ask her to continue her efforts and tell her that you will call her again from the hospital in a few minutes. You then leave for the hospital and, if your plans have been well ordered, you will arrive there at about the same time that the patient does. On arriving there, if neither of your doctors is at hand, you arrange either with the hospital interne or with some more experienced doctor, as the obvious condition of the injured suggests, for Bendel's immediate medical or surgical needs.

The Personal Touch

Unless Bendel is unconscious or is suffering pain of

almost unbearable intensity, you learn, without much talk, just where he lives, and what you can do for him in the way of small attentions, such as having his tools on the job picked up and put away for him, and at the same time assuring him that you will promptly notify his wife or family of his misfortune. Right now is a good time to learn what kind of reactions you may expect from his people when taking this piece of bad news to his home. In the case of a serious injury like this, it is usually impossible to learn immediately the complete extent of the injuries. However, it is usually possible to learn in what way the man is most seriously injured, and in most cases you can learn whether or not the injuries will probably terminate fatally. It is well to have this information in advance of carrying to Bendel's home the news of the accident, because any gross understatement or overstatement of the extent of the injuries destroys confidence, and this confidence may be much needed in a short time. Moreover, bad news travels fast and, if Bendel is not dangerously hurt, you may find a great measure of relief in being able to so advise his family, in case some exaggerated story of the accident has preceded you.

After notifying Bendel's family and attending to such minor matters as need immediate attention, you investigate the accident fully, preferably by an early visit and inquiry made at the job, report the whole matter to your insurance carrier and then feel that your responsibility has ended. Is this really so?

CONTINUED ATTENTION IS ECONOMICAL

If, instead of having passed your liability over to an insurance company for a premium, you were facing the cost of this accident directly by self-insurance, your interest certainly would not stop there. You would know that your actions would be finally approved or disapproved by a board or commission with autocratic powers, interested in very little that you might have to say, but quite interested in what you might be able to show in the way of results. After some contacts with injured men, that spirit of neighborliness, that all humans have in some degree, would probably assert itself and impel you to further interest and action; but if it did not—if you were possessed of about half as much warm blood as an oyster—that sense which enables you to carry on in one of the most highly competitive and hazardous businesses that exist, would urge you to see to it that every available agency was used to repair, as fully as possible, the damage done. You would not be satisfied if Bendel had to suffer some permanent disability, if by any means at your command that prospect could be avoided. You would want to know from your doctor whether any special knowledge not possessed by him or any agency not at his immediate disposal was needed for the better care of Bendel, having always in mind the final result, and your doctor would not take umbrage at your action, for he would know that the medical and surgical field is large and that no one man surveys it all. And if some special knowledge, some further agency was needed for the better repair of the damage, you would, through proper channels, set that knowledge, that agency to work; because you would know that you were a partner with Bendel in his loss; in a partnership that could not be dissolved until your portion of the loss had been fully paid. And, if you are a partner in this serious loss, you are also a partner with each injured man in every other loss caused by personal injury and, therefore, interested in the result in each instance.

Without considering at all the humanitarian aspects of the situation, a very close attention to detail and a willingness to go beyond the legal limitations in the expenditure of money, time and effort for the repair of damage wrought by personal injury is economical. If this last statement is correct, if these methods, these practices are economical for those who bear the employers' portion of the financial burden of this loss directly, would it be advisable to use such methods, such practices where the loss is borne indirectly through insurance? And, if these practices, these methods are advisable where the loss is indirectly borne, and the agencies used for the distribution of this loss are not now using these or similar methods or practices, is it worth while for you who furnish collectively the money to pay these losses, to give some thought to the subject, with a view to bettering the situation? These are questions which you must answer for yourself.

WHAT WORKMEN'S COMPENSATION LAWS REALLY MEAN

There is much more to this subject than what has been mentioned. Have you ever considered the *meaning* of workmen's compensation laws? Have you ever thought of them as other than bothersome rules that have been injected into your business? Have you ever thought of the laws, collectively, or of workmen's compensation as an idea? Well, this idea is society's notice, brought forcibly to your attention by laws on the statute books of nearly every state in this country, that the forces of industry, *employers and employees alike*, have failed to make, without interference, sensible, practical, workable, provisions for a reasonably equitable distribution of the economic loss resulting from accidents in industry. More than that: where compensation laws have been once enacted there has been no repeal, no change to some other system or method; and this is the open confession of the forces of industry, employers and employees alike, that their failure to handle this question has been complete. *Shall we fail too in the reduction of this great loss as we have failed in its distribution?*

Reasons for Slow Loading With Power Shovels

THE position of a power shovel with reference to the face of a cut is in no small degree responsible for the repeated passes some shovel runners make in filling the dipper. The dipper is actuated by two separate and distinct motions: the one known as the "hoist" tends to raise the dipper in a vertical circle above the point of intersection of the boom and the dipper stick, while the other known as the "crowd" controls the length of the radius of the arc in which the "hoist" moves the dipper. In loading, the "crowd" is used to force the dipper against the face of the cut and on the swing to spot the dipper correctly over the hauling unit. When the dipper stick is in a vertical position, the combined motion of the crowd and the hoist can drive the cutting edge of the dipper almost straight forward several feet, and when the dipper stick is horizontal, the crowd serves to hold the cutting edge of the dipper hard against the bank.

When loading the dipper from a bank less than 2 feet high,

Handling Dificult Material Greatly Increases the Cycle Time

direct thrust forward into the bank is required, while on a bank 6 or more feet high, the loading is generally best done by a longer swinging motion in which a comparatively thin slice is cut from the bank. For some reason it appears to be difficult to find operators who will perform both operations equally well. To make the shovel function smoothly when the bank is low, it must stand close to the bank with the boom

Steam Shovel Operation on Shallow Excavation Which Reduces Hourly Output

somewhat lower than normal and must be moved forward frequently. This is because the forward thrust of the dipper, resulting from the proper combination of the hoist and crowd only reaches a relatively short distance. Cutting from a high bank is best done after the dipper has begun to work definitely upward in its swing, which requires that the shovel should stand well back from the bank with the boom high. The

A Full Dipper Load Being Spotted for Dumping into Horse-Drawn Wagon

superintendent who will watch this matter closely and drill his shovel runners in the proper positioning the shovel for effective dipper loading will find the results gratifying.

In addition to these causes of slow loading, namely, poor handling of the dipper itself and improper position of the shovel with reference to the face of the cut, the material itself is responsible for a good deal of slow digging. Banks composed of good sized rocks imbedded in a stiff clay are particularly troublesome. The runner cannot see such rocks and when the dipper strikes one it may be necessary to draw back and try again. Often two or three passes must be made, sometimes twice that many, before either a load of loose material is secured or the exact position of the rock defined so that it can be picked up.

Costs of Power Shovel Operation in Highway Grading

DATA collected by the Division of Management, U. S. Bureau of Public Roads, in studies of power shovel operation, indicate that there are few jobs on which a material increase in output can not be obtained without a corresponding increase in cost. In some cases it has been found possible to increase output as much as one hundred per cent by a change in management methods.

Under favorable conditions, a good operator can attain a rate of loading of four dipper loads per minute for intermittent periods and three dipper loads or more per minute as a continuous rate. By whatever amount the contractor fails to attain this rate under favorable conditions, he is failing to attain the maximum possible efficiency.

Efficiency of operation cannot exceed the efficiency of the shovel operator. To change an operator making a load every 18 seconds for one who takes 20 seconds reduces the output 10 per cent. This can easily amount to $20 to $25 a day in lost profits.

The difference in time required to make a 90-degree swing in loading and to make a 180-degree swing may reduce the output by as much as 25 per cent.

A mass diagram is essential in planning hauling equipment and estimating such on a job. With such a diagram and knowing the time constants of operation, it is possible to determine the most efficient outfit and how long it should take to do the work.

Determination of proper team supply greatly affects the profits. One job is estimated to cost $15,440 with an 8-team outfit which can be done for $14,555 with an 11-team outfit. It is often advantageous to sublet short haul work or to do it with wheelers or fresnos when conditions result in a surplus of teams at the shovel.

Work should be continued under adverse conditions when it is possible to earn more than the difference between the costs which accrue while working and those which accrue while idling.

It has been found that the diversity of kinds and sizes of trucks has produced varied results in meeting the specialized requirements and use with a power shovel. Using trucks on a short haul, it has sometimes been found possible to dump the outfits by backing them to the dump, rather than making a turn at the dump and another at the shovel. Roadway conditions play an important part in truck operation. Pneumatic tires, particularly those of the dual type are preferable.

Crawler type tractors drawing large dump wagons have been found adapted to conditions commonly found on power shovel jobs. The number of trains used must agree closely with economical requirements. As an example the use of one 2-wagon train on a particular job requiring two such trains would have increased the cost of the job nearly $7,200 while the use of three trains would have increased it $1,250.

A State Highway with Two Widening Slabs, Curb and Gutter

McClintic, Colwell & Gordy, Syracuse, Ind., Pour 900 Feet of 18-foot Pavement a Day with 21-E Mixer

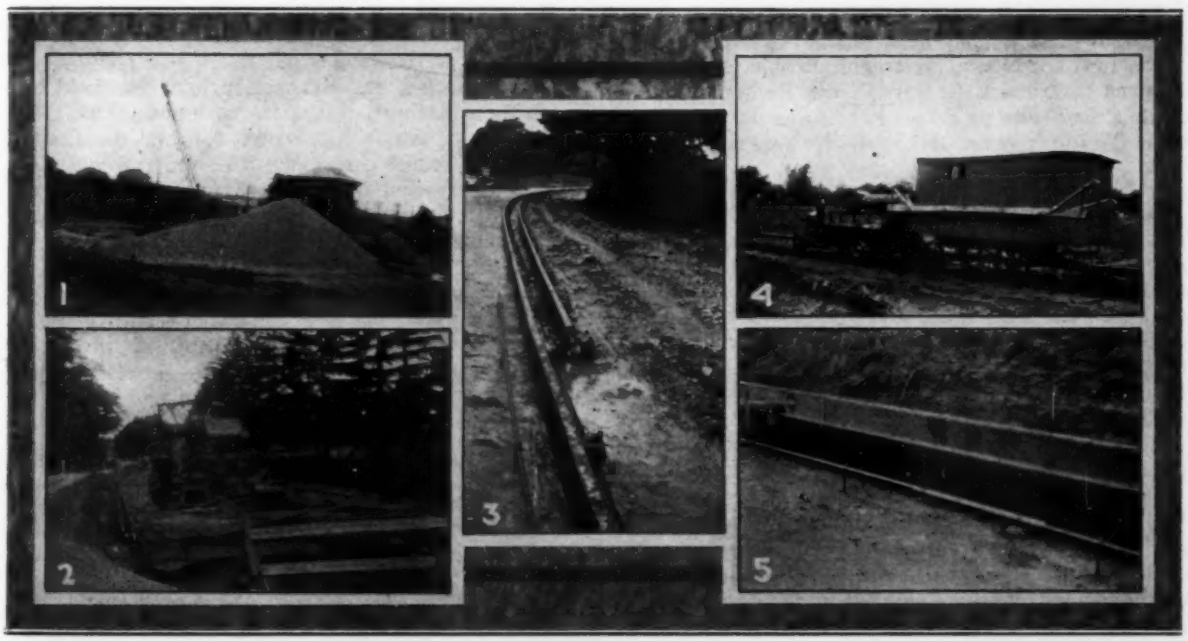
A WELL-BALANCED organization, with plenty of men to serve the various pieces of mechanical equipment, but not too many so that they get in each other's way, is necessary to average pouring 900 feet of Indiana, 9-7-9-inch, 18-foot pavement a day throughout several construction seasons. This is the rate that McClintic, Colwell & Gordy of Syracuse, Ind., has maintained on state highway work for several years with a 21-E mixer. The job on which this article is based was located on Indiana State Route 2, Project 138 from the Illinois State line to Route 41 and thence east to the easterly corporation line of Lowell. This article is confined to the operations east of Route 41. The total contract was for 6.303 miles, the section described being about 3.25 miles in length.

The contract was awarded April 3, 1928 and work started on rough grading April 25. The pouring of curb and gutter began May 15 and the pouring of the 18-foot pavement slab in the center of the 36-foot roadway on June 20.

Grading

Rough grading on the entire job was completed before any concrete work was started. The grading was handled chiefly by two trains of four 1¼-yard Baker-Maney self-loading scrapers behind a 10-ton and a Sixty Caterpillar tractor. The final smoothing of the grade was done with an Adams 12-foot blade grader behind one or the other of the tractors. The grade was rolled with a Buffalo-Springfield 10-ton steam roller.

There was a total cut of about 40,130 yards on the entire job with a waste of 10,000 yards of old macadam through the center of Lowell where it was necessary to lower the grade somewhat. This waste was used to advantage by the contractor in raising the grades of many of the side streets along the route of the state highway. The old macadam was loosened with Lakewood grade-rooters and contractors plows pulled by the tractors and then loaded into trucks with a Barber-Greene loader.



UNLOADING AND CONSTRUCTION EQUIPMENT FOR STATE HIGHWAY WORK AT LOWELL, IND.

1. Blaw-Knox batcher plant with Northwest crane and ¾-yard Kiesler clamshell which unloaded railway cars to stock pile or bins. 2. All set and ready to go as soon as the weather cleared. A Koehring 21-E paver, Lakewood finisher and burlap rolls on a home-made bridge. 3. Forms set for widening curve on the inside. 4. The traveling tool house and truck with gas tank and supplies. 5. Method of lapping, tying and supporting side dowels at forms.

CURB AND GUTTER

A curb and gutter measuring 14 inches high with a 30-inch base and a 6-inch top on the curb was poured with a 1:2:3 mix using a Koehring Dandie mixer and Blaw-Knox steel curb and gutter forms. The work was carried on in loops up one side of the highway through the corporation limits and back on the other. There were three such loops so arranged that the work would be completed on both sides of the street in any one section within a reasonable time.

AGGREGATE AND UNLOADING PLANT

The gravel, purchased from the Western Indiana Sand and Gravel Co., was delivered by rail and unloaded to stock pile or direct to the Blaw-Knox 78-ton steel bins with a Northwest crane and Kiesler ¾-yard clamshell. The bin was equipped with weighing batchers for both the gravel and sand. Sand came from the same producer and was unloaded the same as the gravel.

Seventeen Chevrolet one-batch trucks with pneumatic tires and Lee self-dumping bodies were used to handle the batches from the bins. The empty trucks in starting out or returning from the mixer first went to the cement shed about 400 feet from the bins and 6 bags of cement were dumped into a special compartment next the tail gate which was padded to prevent leakage of the cement. This was covered with tarpaulin in transit. The trucks then went to the bins, received their gravel and sand simultaneously and drove away to the mixer a maximum haul of 2 miles and a minimum of 600 feet.

FINAL GRADE AND FORM SETTING

A 3-ton Galion Junior roller with grader blade under the body was used for final shaping up of the subgrade and for rolling it. The roller blade was used to grade out the form line and operated very satisfactorily.

Two men were used to set forms and two others to do the necessary hand work on the form trench prepared by the roller. This organization has a stock of between 1,300 and 1,500 feet of forms for use on the job so that there were no delays in bringing up forms from a previous days pour. Heltzel forms were used.

CONCRETING CREW

A total of 21 men was used about the mixer including the four working on forms. One man operated the Blaw-Knox turn table, one man dumped the trucks at the skip of the 21-E Koehring mixer. One man operated the mixer while two men spaded and spread behind the mixer and shoveled to the Lakewood finisher which had one operator. Two men were engaged solely on hand finishing of the edge and using the 10-foot floats required by Indiana specifications. These very effectively iron out high spots and show up low places in the fresh concrete.

On widened sections the crown of 2 inches was omitted and at those points the contractor used a homemade screed on the front of the finisher that was very well-designed. It consisted of a 2- x 12-inch plank set on the regular screed with six braces and having a steel plate at the bottom for screeding. This was braced at the back by a 2- x 6-inch timber which effectively prevented warping of the screed. On these widened sections the hand belt was used while on crowned sections on the tangents machine belting was resorted to.

Two men spread the burlap and handled the sprinkling of the green concrete while three others were used to spread the straw and handle sprinkling of the concrete poured the previous day.

Two men set all the steel and oiled both the steel and forms. The steel consisted of Kahlman center strip set with a special jig which held the strip upright while the four pins were being driven. The jig also had an indicator that could be set to show the exact position for the side dowels. The center strip had dowels passing through it every 5 feet. The dowels were ⅝-inch deformed bars 4 feet long and served to bind the two slabs together. The dowels were pinned in position at either end. The side dowels were ¾-inch smooth bars running continuously throughout the job. They were tied with Bates Valve Bag Co. tie wires two at each lapped joint of two feet.

Water for the mixer and for sprinkling was pumped from a creek running through the center of Lowell and not far from the two-thirds point of the work.

To keep all equipment in prime condition and to have supplies near at hand when needed the contractor maintained a portable tool house on flat-tired steel wheels hauled by a supply truck. This was always just ahead of concreting operations. The tool house carried shovels, picks, pipe line materials, spare parts, hose, etc., and on the side a hand screed to use in emergency in case the machine finisher should break down. The truck carried a 400-gallon gasoline tank, an oil drum and barrels of steel center joints, dowels cut to 4-foot lengths, barrels of chairs for supporting the side dowels 6 inches from the side forms and at the mid point of the 9-inch slab.

Before any pouring was started the straw for the entire job was spotted along the work. It was used effectively to block off streets which crossed the highway.

After the curb and gutter was completed the 18-foot slab was poured from the east end of the section to the road leading to the batcher plant.

One-half inch Elastite expansion joint was used between the widening slab and the curb and gutter. The state paid for the 18-foot center slab and the Lowell corporation for the curb and gutter and two widening strips which varied from 7 to 13 feet. There was no expansion joint or dowels between the center slab and the widening strips and only expansion joint between the widening strip and gutter as mentioned above.

An ingenious device for carrying the burlap strips for covering the pavement after the initial set was devised by the contractor. A bridge was built to ride the forms on Ford wheels without tires. The rims provided ample flanges to keep the bridge on the forms and the ball-bearing axles made the whole affair roll easily.

WIDENING CURVES OUTSIDE CORPORATION LIMITS

In widening the 18-foot pavement slab on curves it was necessary to resort to a method that would use the 18-foot finishing machine most effectively. At the end of the form in the length of which the point of curvature fell a second line of forms was started outside the 18-foot line at the required distance. When the finisher had passed onto the first form beyond the form where the point of curvature fell that form was moved out to match the outer line of forms making the widened curve. At the same time the oiled dowel was moved to its proper position in the widened section. Concrete was taken by wheelbarrow to fill the wedgedshaped sec-

tion thus made. Throughout the widened section the finisher ran on the inside forms and concrete wheeled back to fill the section between the two sets of forms. This strip was hand finished throughout. Each inside form was removed as the finisher moved on to the next form and before concrete was placed in the strip.

PERSONNEL

The contracting organization of McClintic, Colwell & Gordy is composed of E. E. McClintic who is responsible for the grading operations, G. W. Colwell who is in charge of the mechanical equipment, and C. N. Gordy who looks after materials. Glenn Gordy is the purchasing agent and time keeper. B. R. Smith was Resident Engineer for the State in this work.

Profits Affected by Size of Load in Dump Wagons

A matter deserving of particular attention in grading operations is the load hauled per wagon. Particular study of this has been made by the Division of Management, U. S. Bureau of Roads, and reported by T. Warren Allen, Chief, Division of Management, and Andrew P. Anderson, Associate Highway Engineer. While there is a great deal of variation in the average yardage taken out per dipper load by a ¾-yard shovel, this variation being in some measure caused by the difference in operating skill but to a much greater degree by the characteristics of the material, the ordinary net output per shovel appears to average about ½-cubic yard or slightly less for ordinary common excavation as measured in place. Where two dipperloads are dumped in a wagon, the average load will then be not far from 1 cubic yard. Under ordinary hauling conditions, this is rather a light load for two good horses or mules and especially so on short haul work where the grades are light. On elevating grader work the 2-horse wagon, 1¼-cubic-yard net size, is, as a matter of general practice, heaped full and when so loaded will carry about 1.3 cubic yards as measured in place. Loads as heavy as this require that more attention be given the roadway than ordinarily is the case, particularly in the east.

A comparison of the yardage moved per load where elevating graders are used and where shovels are used cannot but leave the impression that the practice of putting two dipperloads on to each wagon with no regard to whether dipper is full or not, is bad. Where there is a surplus of wagons at the shovel, not much harm is done providing wagons can be exchanged within the time required for filling the dipper, but where the haul is long and the wagon supply short a very different condition prevails. The shovel is then idle a part of the time so that a little extra effort spent in filling the wagon represents no loss. On the other hand, it takes as long to haul a half-loaded wagon to the dump as it does to haul one that is fully loaded. On long haul work there is much to be gained by hauling full loads. The shovel runner should be charged with the responsibility of seeing that the wagons leave the shovel fully loaded even if it is necessary to put on three or, in occasional instances, four dipperloads of material. The possibility of using the large 1½- or 2-cubic-yard, 3-horse wagons deserves consideration.

In selecting hauling equipment, care should be taken to see that the units can be so handled that no single operation such as turning, dumping or maneuvering will necessarily consume more time than is required for loading. Otherwise, this operation and not the shovel becomes the pacemaker. For ordinary highway grading work where fast shovel operation is so frequently possible, a hauling unit having a unit capacity of less than two dippers per load should never be considered. For ease in maintaining fast shovel operation, hauling units carrying three or more dippers per load are very desirable, providing of course, that they are otherwise adapted to the job.

Loose Dry Material Falling from the Top of the Dipper

A Model 100 *Cletrac Owned by L. G. Carey Hauling a Russell Elevating Grader on the New Bainbridge Park Race Track at Geauga Lake, Ohio. The Grader Is Shown Delivering Earth to a Dump Truck Made Up of a Hughes-Keenan Body Mounted on a McCormick-Deering Tractor*

Proper Safeguards in Building Construction Lessen Overhead

CONTRACTORS who take the precaution on their operations to safeguard the conditions under which their employes work not only reduce the number of casualties with attendant loss of man power and suffering, but also materially cut down their overhead, according to a statement recently made by Samuel B. Donnelly, a member of the Accident Prevention Committee of the Building Trades Employers Association, New York City, which is conducting a safety movement to inform the public of the necessity for this action.

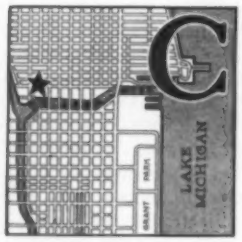
"It is a known fact," said Mr. Donnelly, "that general contractors who use good judgment in safeguarding the interests of their employes on operations profit in the long run by reducing the number of accidents, thereby increasing the efficiency of workmen and materially lessening their overhead charges for compensation and liability insurance.

"There are many builders in New York today who have established rigid rules for the protection of their men. The extra expense of supplying materials and labor for these safeguards is more than offset by the resultant reductions in the amount of insurance premiums they pay annually.

"It is an amazing situation to see the nonchalance with which general contractors and mechanics on some jobs in this city carry on their work. They do not realize that a good record means a saving of money and of man power and the absence of suffering and misery that always follow in the wake of a serious casualty."

Material Handling for the Merchandise Mart, Chicago

Construction of World's Largest Business Building Develops New Methods of Interest to Contractors



CONSTRUCTION of the Merchandise Mart in Chicago, a structure that is claimed to be the world's largest business building, has revealed new methods of handling materials and its preparation for the foundations that will involve the excavation and construction of 472 caissons to hardpan. A huge concrete mixing plant has been carefully designed and laid out to reduce labor costs to a minimum.

Soon after work on the excavation for the caissons was started, the first boatload of cement was delivered on the Chicago river. The boat, a torpedo-like craft, contained 2,000,000 pounds of bulk cement which was shot by means of compressed air from the boat through 5-inch pipe 75 feet in the air to the hopper above the concrete mixing plant. This is believed to be the first time that building materials have been carried by boat direct to the site of a large building project and also the first time that cement has been elevated so high by this method to storage at a mixing plant.

The cement on the work is supplied by the Manitowoc, Wis., Portland Cement Co. The cement was loaded into this boat, said to be the only one of its kind in the world, from storage silos by means of the Fuller-Kinyon system. The boat, named the Daniel McCool, is a steel twin screw, diesel powered vessel, 157 feet long, 33 foot beam and with a rated tonnage of 373 tons net and 649 tons gross, and capable of 11 knots an hour and 10 knots when loaded. It contains six bunkers, three on each side, built in the form of hoppers with a total capacity of 4,200 barrels. The main equipment of the vessel consists of two Fairbanks-Morse diesel engines connected to the propeller shaft for propulsion and each direct-connected to an electric generator. These generators provide power for operating the air compressors and electric motors used in unloading the cement.

When the ship is being unloaded, the cement feeds down through gates in the bottom of the hoppers to a horizontal screw conveyor system that leads the cement to a pipe containing an air jet at a pressure of about 60 pounds per square inch. By this means the cement is carried through the pipe line to the dock side and then through flexible connections to the pipes leading ashore and up 70 feet to the tops of the cement bins. It takes about seven hours to unload the ship.

Proportioning Plant

The cement for each batch for the mixer is fed into an automatic adjustable batcher balanced on a standard scale so arranged that the supply is shut off when the scale beam set for the weight required for the batch is balanced. The cement is then dropped from the weighing device to the loading chute leading into the mixer.

Aggregates are delivered by rail direct to the mixing plant. A Brownhoist locomotive crane spotted on a track between the cars and the plant and equipped with a clamshell bucket unloads the aggregates from the cars to the proper stockpile on either side of the plant structure. The stockpiles are placed on platforms fitted with gates along their center lines and a belt conveyor running beneath each pile receives the aggregate through the gates and transports it to the bottom of a bucket elevator on the same side of the plant. These two elevators lift the aggregate to the elevated bins that are a part of the mixing plant structure.

A gate from each elevated bin opens over the charging hopper of the two Koehring 1-yard mixers. The top of this charging chute is just clear of the level of the floor on which the proportioning devices are located and the chute is partitioned to afford a volume measurement of the aggregate for the batch. At one side a water barrel with an automatic float valve gives the required volume of water and with the bottom discharge valve fitted with a trip cord, provides the water for each batch.

The controls of the mixers are extended to the floor above so that it is possible to control the entire operation of the plant with but two men. One man takes care of aggregate, water and loading the mixer, while the other weighs out the cement and discharges the mixer. The only other men needed in the central proportioning plant are a crane operator and oiler and a man to run the two conveyors and elevators.

Truck Drivers Load Own Truck

On the next lower floor, the mixer is mounted. It discharges into a field hopper in the floor that is so mounted that its gate is just above the driveway below the north half of the plant on the ground level. While at first a man had to be stationed at this hopper to load the truck the contractor has now rigged up the gate so that the truck drivers can secure their own loads without extra help. The mixing time is 1½ minutes and the total mixing cycle is 2 minutes.

Clark Tructractors equipped with rubber-tired wheels and 1-yard dump bodies are used to transport the concrete to the caissons and upon arrival each load is dumped directly into the caisson.

Caisson Excavation

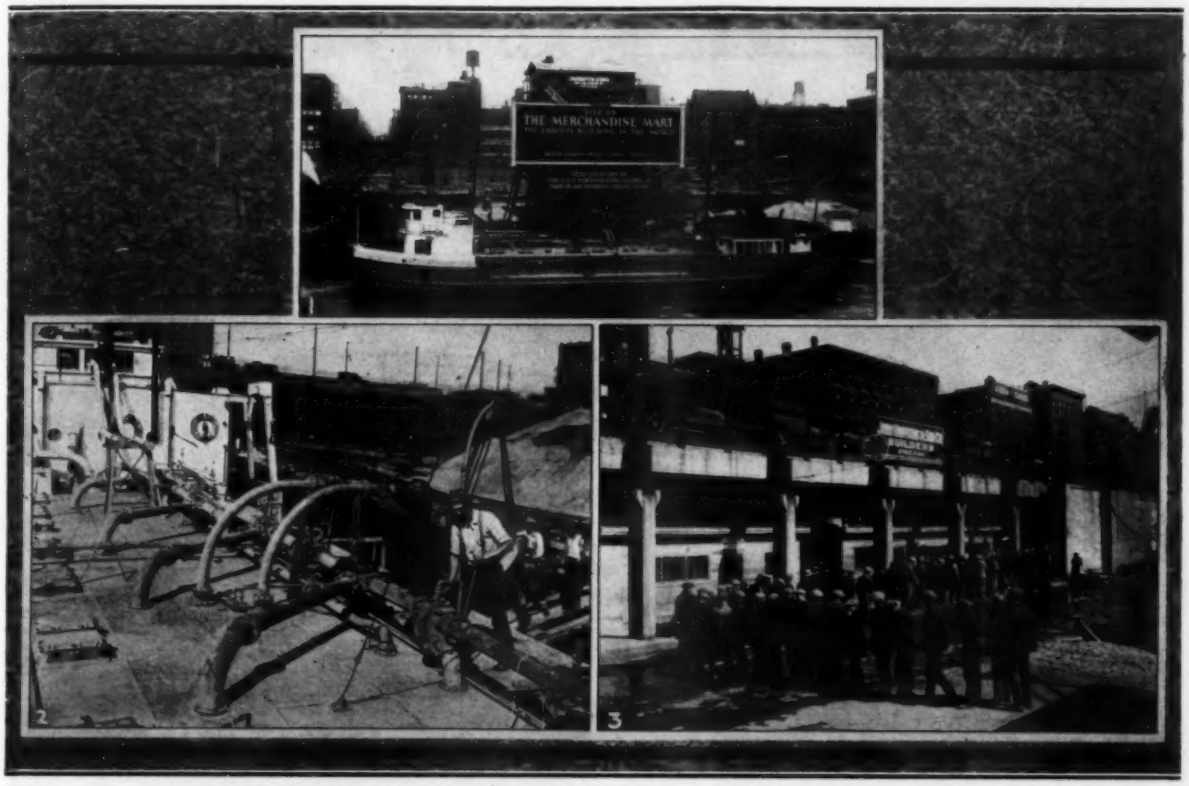
The caissons are excavated by two diggers in the bottom of each one, working with air spades. A plat-

form and head frame is set up over each caisson with the platform elevated about 7 feet above ground level. An individual electric niggerhead hoist is installed on the head frame which permits the hoisting of the buckets of clay loaded by the two men in the caisson. The top crew consists of a hoist man and a dumper. The dumper takes the buckets of clay as they are raised and dumps the clay on to the platform. Whenever one of the Tructractors used for hauling the clay stops at the platform the dump man loads this clay into the truck to be carted away. The excavation of the caissons is being done in groups of 25 to 30 and about 6 or 7 are finished each day. As excavation proceeds, lagging and rings are lowered into the hole and set up by the diggers in the usual manner.

The small Tructractors haul the clay to the river bank where two cantilever runways have been erected projecting out over the river. These permit the trucks to run up to the end and dump their loads into a barge moored at this point. The runways are so spaced that two compartments of a barge can be loaded at the same time, one from each runway. When loaded the barges are towed out to the lake and the contents used for fill.

About 1,000 men working in three 8-hour shifts are employed in building the foundation for this structure, which is to be completed in 1930. The Mart will occupy a space fronting 724 feet on Kinzie St., 577 feet on the Chicago River, 324 feet on Wells Street and a diagonal frontage facing on Franklin and Orleans Streets, and will be set back from the river about 80 feet to provide for a future two-level river bank drive, similar to Wacker Drive on the opposite side. The building will be eighteen stories high with a total floor area of 4,000,000 square feet plus additional floor space in the tower reaching five stories higher.

Since the site is occupied by the inbound and outbound facilities of the Chicago and Northwestern Railroad, a temporary freight house had to be provided and the ground floor level of the Mart when constructed will be devoted entirely to these facilities. This project involved the utilization of air rights. The building proper begins 23 feet above datum or about this distance above the elevation of the rails of the railroad property. The project will involve the expenditure of about $30,000,000.



HANDLING CEMENT FOR THE FOUNDATION OF THE NEW MERCHANDISE MART

1. The Daniel McCool cement boat delivering bulk cement to the elevated storage bins. 2. Close up of deck, showing permanent pipes and flexible connections for pneumatic delivery of cement. 3. The night shift of sand hogs and hoist men being paid off

Construction Twelve Months a Year

CUSTOMS and conditions have roots. Back in the days when our construction industry was started, winter work was a matter of real difficulty. The equipment for overcoming the obstacles in the way of the builder was lacking. Neither men nor methods were able to meet the situation save under the greatest handicap. Naturally, then construction was put off until spring and the winter was left unchallenged.

Since those days we have progressed considerably. We know how to battle cold, we have equipment that is equal to the severest climatic difficulties. We know how to protect the worker and as a result we can build as well in winter as in summer. This is not theory nor the embodiment of a desire. Winter construction can be and is as satisfactory as summer construction.

Welding a Cast Iron Compressor Cylinder

A WESTERN foundry had occasion to purchase a large stationary air compressor from an Eastern firm. When the compressor was set up in the plant, it was found that it had been damaged so badly in transit that when put into operation, the cylinder wall leaked and instead of pumping air, it pumped water from the water jacket.

The plant welder dismantled the compressor and after veeing the crack in the cylinder wall, which extended between the two intake air ports, he slung the casting on an overhead trolley and ran it out into the yard. Next, a small brick pre-

Oxwelding the Cast Iron Compressor Cylinder, Showing the Preheating Furnace

heating furnace was built under the suspended piece. A charcoal fire was lighted and the preheating flames confined to the damaged portion only. After sufficient heating of the cast iron piece, welding was begun. A good quality of cast iron rod and flux was used. The weld was completed in a few hours without difficulty.

Estimates on the time and money saved on this repair job are of interest. The plant suffered only a few hours shutdown and the total repair cost was but a trifle over $25. Under the old method of scrapping and replacing the damaged part, a delay of several weeks would have been necessary and an expenditure of several hundred dollars required for a new part.

Marble Canyon Highway Bridge Open to Traffic

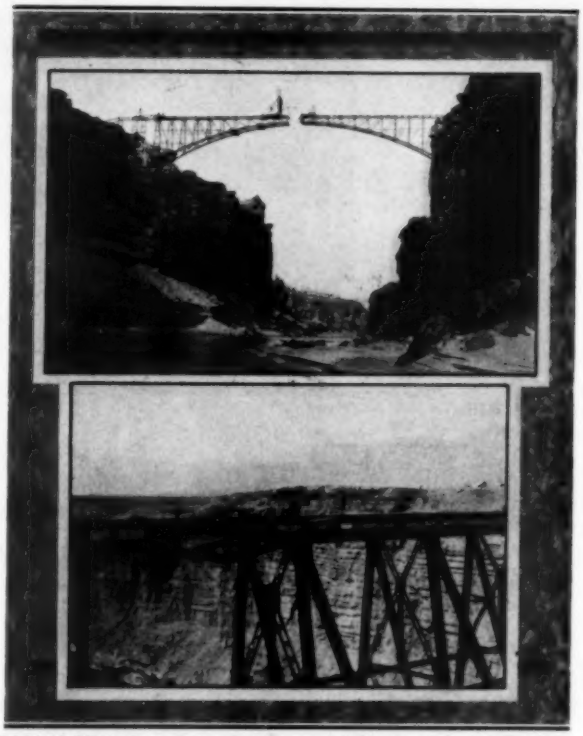
THE Marble Canyon Highway Bridge over the Colorado River in northern Arizona, 140 miles north of Flagstaff, Ariz., near Lees Ferry, is constructed at a point where the walls of the canyon are 600 feet apart and rise perpendicularly over 500 feet above water level. The walls consist of heavy horizontal layers of very fine and hard limestone and afford ideal conditions for erecting a bridge by the cantilever method.

The bridge was designed as a three-hinge arch structure with a 616-foot span and 103-foot roadway. One end of the arch span has a 50-foot approach span and the other end two 84-foot approach spans making the total length of the bridge 834 feet. The total weight of steel is approximately 1,000 tons, of which 900 tons are in the arch and 100 tons in the approaches. There was no way of getting materials across the canyon except on an overhead cable. This cable handled all of the material and the heaviest piece of steel weighed about 12 tons.

It was necessary to construct the bridge in two sections, one-half of the arch at a time. The south section of the arch was completed first in eleven sections and then, from a point half way across the canyon the cable was connected with the opposite side of the canyon wall and the remainder of the steel carried across.

The two arches of the bridge were built so that each end extended in a slight upward direction rather than horizontally. This was done to take care of the live load and expansion. Each half of the arch weighs approximately 500 tons. Large toggle joints were installed at each end of the bridge so that the connection could be made at the proper time. When the bridge had been completed early in September, and everything was ready, the final test came. The bridge as completed lacked 18 inches of meeting in the center. There had been some disagreement by the engineers as to whether or not the toggle joints would hold the enormous load and permit both halves of the arch to be lowered 18 inches and make a perfect joint.

All members of the Arizona State Highway Commission, officials from all over the west, besides structural steel engineers from Kansas City and representatives of the Kansas City Structural Steel Co., erectors of the bridge, were present to witness the final joining. Precautions of every kind were taken that when the toggle joints were manipulated both halves of the span dropped down 18 inches and formed a perfect solid wedge. Two 10-inch pins were inserted to form the com-



COMPLETING THE STEEL BRIDGE AT MARBLE CANYON

Top—General view of bridge and canyon, showing ends approaching. Below—The toggle which successfully drew the ends together to permit the insertion of the center pin.

pleted bridge. These pins, together with the pins at each end of the bridge, carry the entire load. They are made of special nickel steel and were subjected to minute tests before installation. The toggle joints were operated by 30-horsepower engines.

TWENTY-FIVE different road projects are now under construction in New Mexico. This work will cost in excess of $3,036,000. The largest job is 26.1 miles in length. Fourteen different contracting companies are engaged in this work, which ranges all the way from dirt grading to concrete pavement and both timber and steel bridges.

The New York Skyline, 1873-1928

In 1873 New York Contained About a Million Inhabitants. The Towers for Brooklyn Bridge Were Only Just Beginning to Rise. The Figure with the Tall Hat in the Foreground Is John H. Roebling, Builder of the Bridge

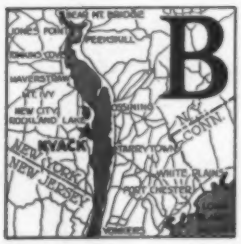
IN its monthly bulletin, "The Skyscraper," the Thompson-Starrett Co., of New York, published the two illustrations which we are privileged to reproduce on this page. No skyline in the world is so well known as that of lower Manhattan, with its towering structures, each seeming to vie with the others in an effort to reach farther into the sky. So dense has this section been built that, viewed from the harbor, it appears as a solid mass rising hundreds of feet above the water level, while the jagged peaks of countless towering buildings add picturesqueness to the whole.

Contrasting with this the same skyline in 1873 one marvels at the revolutionary change that has taken place in the last 55 years. This transformation of New York within the memory of man is one of the greatest romances of America, and one in which the Thompson-Starrett Co., and other well-known contracting organizations have played an important part.

View of Lower Manhattan in 1928 from the Same Spot as that Above, Showing What a Vast Army of Contractors Has Accomplished in Altering the New York Skyline

A Three-Strip Pavement Over a Long Hill

Dyer, Kane Co., Passaic, N. J., Builds 1.42-Mile Road on Route 9-W in Rockland County, New York, In Seventy-Five Working Days



BARMORE'S HILL or the Rockland Lake Hill in Rockland County, N. Y., between Nyack and Haverstraw, has long been considered a bad strip of road by motorists driving through from New York City to the west via Albany. Following the policy of having only the best type of roads on the east and west traffic arteries following the Hudson River north from New York City and the New Jersey line, the New York State Highway Department this year, as one of the three projects in Rockland County, paved the 1.42-stretch north of the Upper Nyack concrete road laid some three years ago. This job involved considerable rock cut, a total of about 21,600 yards to eliminate a bad right angle turn in the old narrow bituminous macadam road at the top of the hill.

Quantities and Prices

The quantities in the State Highway Department Engineers' estimate and the bid prices of the Dyer, Kane Co., of Passaic, N. J., for the Rockland Lake job, known as County Highway 1295 and reconstruction contract 1696, were as follows:

Grubbing and clearing	$750.00
36,000 cubic yards unclassified excavation (this turned out to be about 60 per cent trap rock) at	1.70
Shoulders, 7,720 linear feet at	.15
Fine grading, 25,650 square yards at	.15
10,400 barrels of portland cement at	2.40
25,650 square yards of reinforcing at	.25
5,700 cubic yards of 1:2:3½ concrete, exclusive of cement, at	7.00
22,590 linear feet maintaining traffic at	.40

The total bid for this 1.42-mile job was $149,300.

Grading

The total excavation for this work was about 36,000 cubic yards, of which 15,000 was earth and 21,600 rock. The contractors, Dyer, Kane Co. of Passaic, N. J., started grading on May 20, 1928, using three one-yard gas shovels, two of which were Osgoods and one a Thew. During June and early July, in spite of nearly two weeks when it rained every day, only half a day was lost on the job as the shovels were able to work at all times.

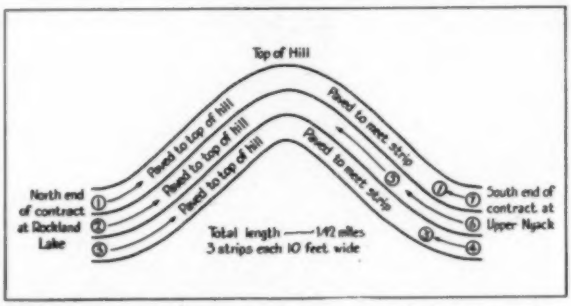
Because of the extensive rock and relocation of the road, there was considerable blasting and at one point where a charge was a bit heavy for the overburden, a section of about 75 feet of the old rock wall on the east side of the road was blown out. This wall had been laid up dry to grade some ten years ago, and then concreted for the 3½ feet above grade. The wall itself was from 18 inches to 2 feet thick. The rock had been drilled to grade for the blasting and apparently the shock of the explosion dislodged the dry stone at the base of the wall, permitting it to slide out.

Fine Grading

For the fine grading an Austin one-man grader was employed with ten men on the grading gang working with picks and shovels. For the final compaction of the grade a Buffalo-Springfield gasoline roller was used. A home-made scratch template running on the forms was used to check the final subgrade. The 8-inch Heltzel steel forms were set by a gang of 8 men.

Concrete Operations

Aggregate and cement for the 1:2:3½ mix were hauled at a per-batch rate by Ward Brothers of Suffern. Ward Brothers are the owners of an extensive sand pit at Mount Ivy, N. Y. From this pit sand was trucked to Haverstraw and unloaded at the lower end of a 60-foot Barber-Greene conveyor, about 100 feet west of the concrete silo bins of the New York Trap Rock Co., about one mile south of Haverstraw at the junction of the New City-Haverstraw road with Route 9-W. The conveyor delivered the sand to a large wood bin which served a Blaw-Knox batcher.


Top of Hill
Paved to Top of hill
Paved to Top of hill
Paved to Top of hill
Paved to meet strip
Paved to meet strip
North end of contract at Rockland Lake
South end of contract at Upper Nyack
Total length —1.42 miles
3 strips each 10 feet wide

Order of Paving the Three Strips on the Rockland Lake Job of the Dyer, Kane Co.

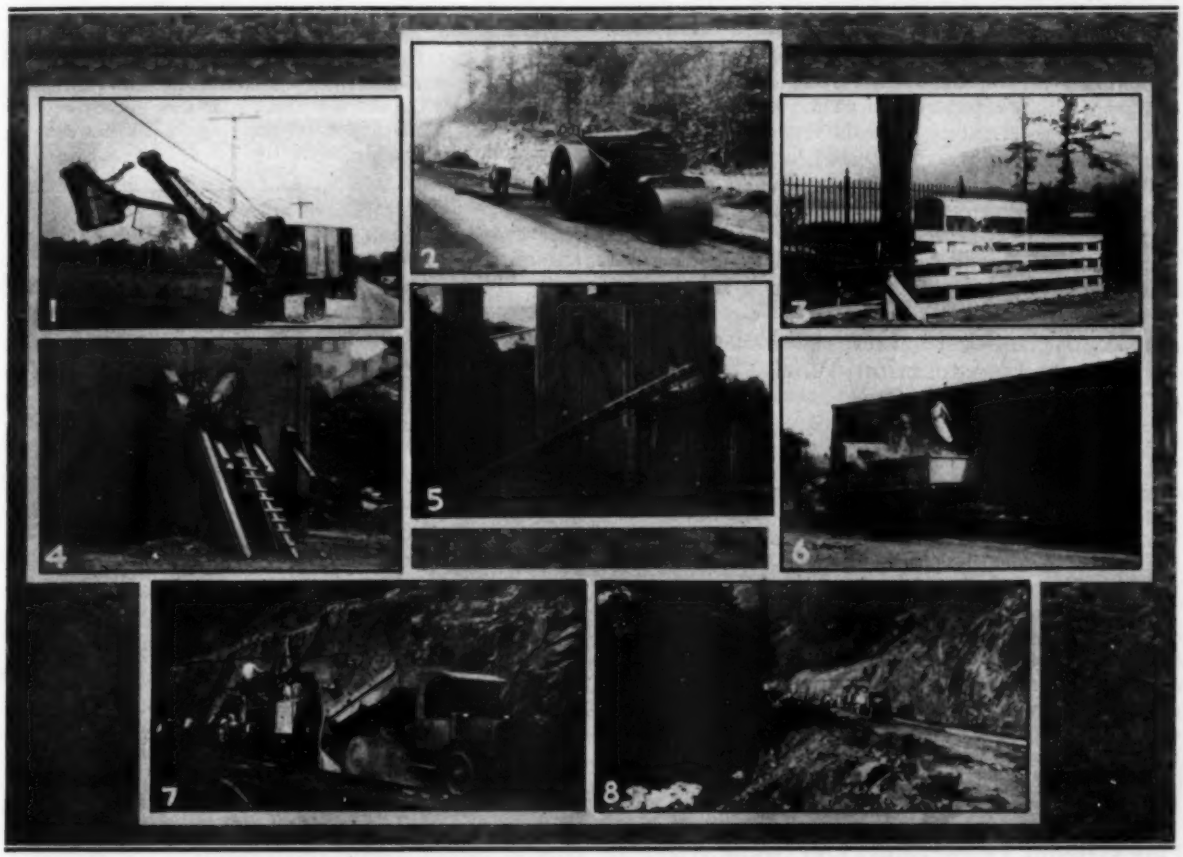
The bin with the proper sized stone had been tapped and a wooden chute set up to deliver stone to a second batcher. The Ward Brothers trucks first received the proper amount of stone at the stone batcher, then backed under the sand bin and received the sand. Following this the trucks were driven about four miles to a freight siding of the West Shore railroad at Congers, N. Y., where the Acme cement was dumped on the

batches and covered with tarpaulin. This entailed an 11-mile round trip for the trucks delivering the batches.

Water for the mixer was pumped from a sump at the end of a 150-foot ditch leading from Rockland Lake at the north end of the job. A Metalweld-Worthington pump was used, delivering water under pressure through a 2½-inch pipe. The only criticism that may be offered on this arrangement was that no shut-off valves were cut into the line, so that if there were a break in the line beyond the mixer it was necessary to shut down the entire line while repairs were made, thus stopping the concreting.

The concreting gang consisted of 21 men with Luigi Migle, foreman. The gang comprised: one man for dumping the trucks and who also attended to moving the hose and signing the receipts for the batches delivered by the Ward Brothers trucks; a mixer operator; two men working on final grade behind the mixer; four men shoveling the concrete in front of the mixer; one man spading on forms; six working on the hand screed; two spading in front of the screed; two men operating the 10-foot hand floats, finishing and brushmarking the pavement; and two men spreading the burlap, hay and watering it down during the curing period. It is interesting to note the entire absence of mechanical finishing equipment. The contractor felt, however, that with the three 10-foot strips on this job mechanical finishing equipment was no more economical than hand operation, as far as costs were concerned. Speed of operation was not held up in any way as the contract called for the job being completed in 150 working days. Concreting was finished at the end of 75 days and curing and all of the work on the shoulders complete and accepted at the end of 100 working days. Concreting started July 20 and was completed September 27. This remarkable speed was attained with an average pouring of an 800-foot strip per day and in spite of about three weeks rain in the latter part of July and early in August which delayed concreting. The accompanying diagram shows the sequence of pouring the three 10-foot strips over the entire length of the project.

Elastic ¾- x 8-inch x 10-foot expansion strips were used every 78½ feet according to New York State specifications. A 27-E Multi-Foote Paver poured the entire job. Local labor was used in large measure throughout the work, there being about 110 men em-



BUILDING THE CONCRETE ROADWAY AT ROCKLAND LAKE, N. Y.

1. The Lorain-60 that handled much of the rock excavation. 2. Buffalo-Springfield gas roller and scratch template that rolled and checked the fine grade. 3. Metalweld-Worthington pump which pumped Rockland Lake water over the hill for concrete and curing. 4. The stone bins of the New York Trap Rock Co. at Haverstraw, where the Ward Bros. trucks picked up the first of the aggregate. 5. Barber-Greene conveyor handling sand from pit to bin and Blaw-Knox batcher. 6. Loading cement in sacks on batch at Congers, N. Y. 7. Batch delivered to skip of Multi-Foote 27-E paver. 8. Section of old retaining wall which was laid up dry to grade blown out when ledge was being removed to other side of road.

ployed on the job, most of them coming from Rockland County.

PERSONNEL

H. D. Dimmock, Junior Assistant Engineer, was in charge of the work for the New York State Highway Department under J. S. Bixby, District Engineer, Poughkeepsie, N. Y. C. P. O'Connor was Superintendent for Dyer, Kane Co., of which E. Dyer is President and Major Lester Fackiner is General Superintendent and Engineer. Major Fackiner during the past season acted as superintendent on a 7-mile job about 15 miles north of the work described in this article. This second job will be described in an early issue of CONTRACTORS AND ENGINEERS MONTHLY.

Stoddard Martin was Junior Assistant Engineer in charge of the concrete pavement for the State, James Stoddard was Assistant Superintendent, and was in charge of figuring the daily costs for the contractor, making it possible for the contractor to know the cost of operating from day to day. Mr. Stoddard is now at Bear Mountain in charge of a sub-contract for Dyer, Kane. Louis Megalia was in charge of concreting operations for the contractor.

A. I. S. C. to Discuss Noise in Construction Work

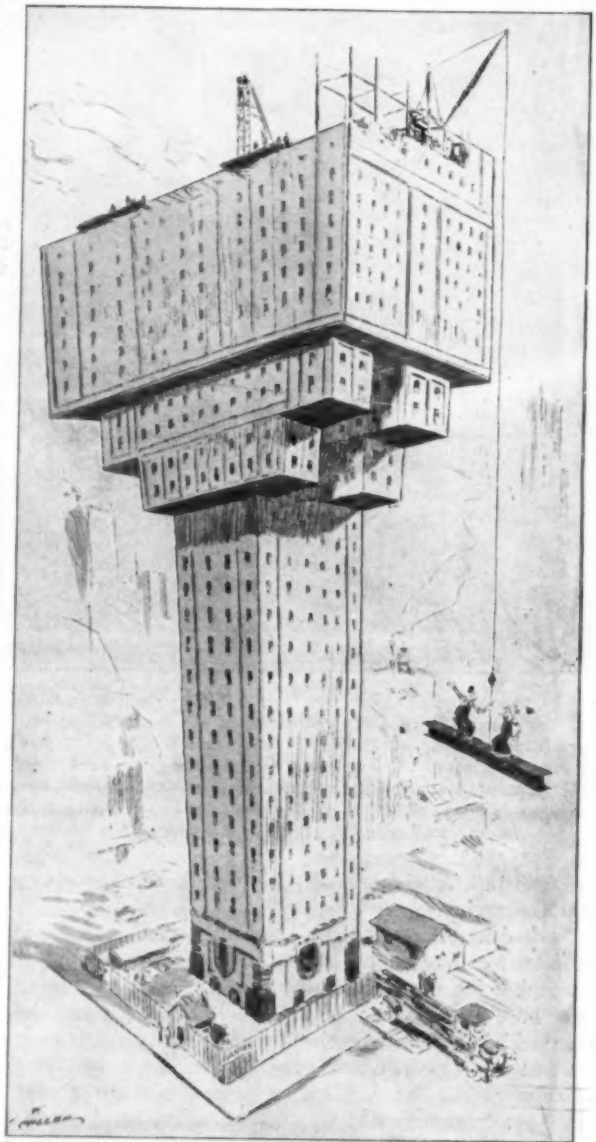
THAT the editorial appeals of construction publications and newspapers for less noise in construction work, have met with some measure of success, is proved by the fact that the American Institute of Steel Construction is to devote a portion of one session of its convention November 13-17 at Biloxi, Miss., to the elimination of noise in construction work. Two special addresses have been scheduled, the first by Fred T. Llewellyn, President of the American Welding Society, who will discuss welding as applied to structural steel. The second address is by J. R. Dawson, Metallurigcal Engineer of the Union Carbide and Carbon Corp., who will discuss flame cutting of structural steel. These talks are to be followed by demonstration tests of flame cutting. Articles on the various phases of welding in building construction and the elimination of noise have appeared in CONTRACTORS AND ENGINEERS MONTHLY this year as follows: August, 1927, pg. 87; December, 1927, pg. 68; March, 1928, pg. 164; April, 1928, pg. 257; August, 1928, pg. 94.

Don't Begin Operations Too Soon After a Rain

A major factor in the creation of bad hauling conditions over roads in grading operations is the running of trucks over the road too soon after rains. This naturally raises the question of idle time losses. In principle, the solution of the problem is along the same lines, but the relation of idle time costs to operating costs is in this connection so different that the result is materially changed. To take as an illustration a shovel at $50 a day, operations at the dump at $25 a day and four trucks at $25 a day each, giving a total operating cost of $175 a day. As a rule no stock is used on such a job and particularly in the east no camp is maintained. The only full time men are the job foremen, the shovel runner, watchman, and perhaps a timekeeper. Ordinarily, the idle time cost will not exceed $30 or $40 a day and the difference between the cost of working and remaining idle will be from $135 to $145 a day or roughly, four-fifths of the average operating cost.

On typical truck haul jobs, it is generally cheaper to remain idle than it is to work unless the output which can be required is near 80 per cent of that which is required to pay the full operating expenses at normal working conditions. When teams are being used, it is desirable to work whenever it is at all possible, whereas when trucks are being operated profit is almost certain to be reduced by operating before at least three-fourths of the yardage necessary to pay the full cost of normal operation can be secured. This deduction is based only on the relation between idle time cost and operating costs by the Division of Management, U. S. Bureau of Public Roads. It is strongly supported by the fact that beginning operations too soon after rains creates road conditions which slow down subsequent operations and also damage the hauling equipment. These facts strongly emphasize the general observations that there is a prevailing tendency to operate truck jobs too soon after rains with the result that much profit is needlessly dissipated.

Where heavy trucks are used loading is generally done behind the shovel, but it could frequently be done at the side. In loading at the side there is a problem of truck substitution without delaying the shovel. This can be done readily enough if the bottom of the cut is solid and the shovel has cleaned up carefully.



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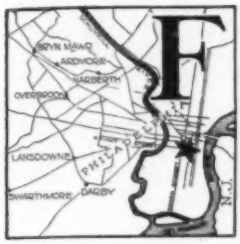
"Gosh, Bill, We've Gone and Read the Specifications of This Offset Job Backwards"

Placing Pedestal Piles for Jefferson Medical College

By Daniel J. Hauer



FOR building construction, both in new work and in underpinning old walls, concrete piles have almost entirely taken the place of timber piles in our large cities. Architects and engineers are convinced that such piles, no matter of what design, are capable of carrying greater loads.

The Jefferson Medical College, located at 1017-1033 Walnut Street, Philadelphia, is erecting a 12-story building, the methods of sheathing and shoring the basement excavation for which are described in the October issue of CONTRACTORS AND ENGINEERS MONTHLY. Excellent gravel is found in that part of the city to carry sufficient loads for such a building at a depth of about 20 feet below the curb, but, inasmuch as the city contemplates building a new subway within a few years along Walnut Street, the owners of the building deemed it wise to carry their foundations on Walnut Street to a greater depth that they might be below the floor of the proposed subway. It was accordingly decided to drive 68 Hercules steel pedestal concrete piles.

DRIVING AND ALIGNING THE PILES

The method of constructing the piles is very simple and effective. Two piles are driven side by side, each pair of piles being on about 5-foot centers, and the two piles being on about 2-foot centers. The top of the steel shell, which is in this case 10 feet long, is driven about 8 feet 10 inches below the grade of the subbasement. Should the top of the steel cylinder, which for such lengths is made ⅜-inch thick, be at an irregular elevation for some good reason, the steel is cut off by acetylene torches to the proper uniform elevation.

The piles are driven with a No. 7 McKiernan-Terry air hammer, air being furnished by two Ingersoll-Rand compressors of 310 and 220 feet capacities, set up on the street. Two air tanks on the floor of the subbasement maintain an equalized pressure of 100 pounds. A small stiff leg derrick with a 20-foot boom is operated by a Lidgerwood air hoist picking up the steel cylinders and placing them, raising, lowering and holding the air hammer in place.

The piles are kept straight by wooden frames set upon the ground with wooden wedges driven between the cylinder and the frame. A small spirit level is used by the pile man to give him exact data on the alignment of the pile and by use of extra wedges he keeps the pile vertical.

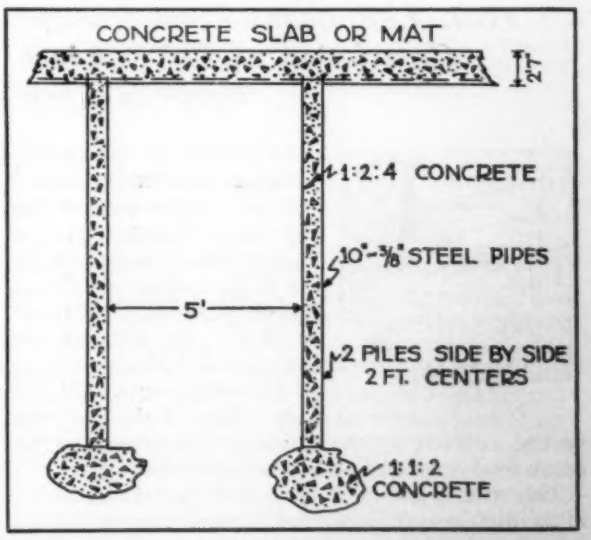
FILLING THE SHELLS WITH CONCRETE

After the piles are driven an air pipe is forced into the steel shells and air at 100 pounds pressure throws the earth, gravel and water out of the pile form. This is done both cheaply and effectively so that the hollow shell stands ready for the concrete. A 1:1:2 mix using Lumnite cement is put into the pipe in small quantities and an iron rammer weighing about two tons is raised and lowered by the Lidgerwood air hoist to ram the concrete into the ground at the bottom of the steel shell. This process is continued until a concrete bulb from 2 to 3 feet in diameter, as shown in the illustration, has been formed at the base of the shell. The bulb becomes the pedestal of the pile and as the quick setting cement hardens it gives the pile great bearing power. The rest of the shell is later filled with 1:2:4 concrete from a Smith No. 7 mixer.

When more than one section of shell is driven, the two sections are joined by water tight sleeves which combine lateral strength with firm bearing. This type of pile can be jacked down under existing walls for underpinning and can be driven within 3 inches of party walls without in any way injuring the wall, thus eliminating cantilever beams and other expensive means of taking care of such building conditions.

TESTS OF PILES

On a previous job done for the Jefferson Medical College in similar soil a test of a 15-inch Hercules steel cylinder pile, formed as described above, was made. With a load of 114-tons on one pile, there was a settlement of only ⅛-inch and when the test load was taken off the rebound was 1/16-inch. Due to such tests in Philadelphia and New York these piles are acceptable without reservation for loads of 50 tons.



Typical Section of Concrete Slab or Mat with Supporting Piles of the Jefferson Medical College, Philadelphia

PLACING THE CONCRETE SLAB

A concrete girder slab or mat is placed upon the piles. On this job the piles run into the slab from 6 to 8 inches. The slab is made of 1:2:4 concrete using Atlas cement and is reinforced with ¾-inch rods on 6-inch centers both ways. Upon this mat or slab the structural steel columns are placed and are waterproofed to the level of the subbasement floor. The inside diameter of the piles is 10 inches, and the thickness of the concrete slab runs about 14 inches.

The building is to be of brick, steel and concrete. The architect is Horace Trumbauer of Philadelphia. Doyle and Co. are the general contractors, while the Underpinning and Foundation Co. of New York and Philadelphia are the contractors for designing and placing the piles. The estimated cost of the structure is $1,500,000.

The Effect of Mixing Time on Concrete Production in Paving

UNDER current specifications as commonly enforced, the minimum time required per batch for various mixing periods and the number of batches that could be produced in an hour if the rates shown could be maintained without interruption or loss of time are shown in the following tables prepared by the Division of Management, U. S. Bureau of Public Roads.

To produce concrete at the rates shown using standard pavers for the several mixing periods, it must be assumed that there is no loss of time between batches and the mixer is operated continuously for the full length of the working day. In practice such full production is seldom, if ever, attained and production averaging 70 per cent of the theoretical maximum would ordinarily be considered quite satisfactory.

MINIMUM TIME REQUIRED PER BATCH FOR VARIOUS MIXING PERIODS

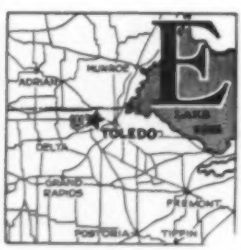
Specified Mixing Time	1½ Minutes *Seconds*	1¼ Minutes *Seconds*	1 Minute *Seconds*	¾ Minute *Seconds*
To raise skip	10	10	10	10
Charging lag (to permit all material to run into drum)	5	5	5	5
Actual mixing time, all other operations fully overlapped	90	75	60	45
Total time required	105	90	75	60
Batches to be had per hour	34	40	48	60

Whether the mixing period be 1½ minutes or ¾ minutes, therefore, it must be recognized that the full production corresponding to the two periods cannot be hoped for. From the practical standpoint the important questions are whether the reduction in the mixing period can be utilized to increase production and how fully it can be utilized.

It must be admitted that it is much easier to organize a job to serve the mixer fully for a 1½-minute mix than it is to serve a ¾-minute mix. Still records collected by the Bureau of Public Roads on 19 jobs in a state where a 1¼-minute mix is required show an average hourly output of only 22 batches during periods when work is under way, while an average hourly production of over 40 batches is rather common in another section where a 1-minute mix is permitted, and averages of over 45 batches per hour are known to have been sustained over considerable periods of time. This suggests that there is a tendency for the actual rate of production to fall below the maximum permissible rate whether the latter be relatively high or low and that the actual rate rises as the permissible rate is raised. If this be true then the questions that must be determined are, 1, to what minimum period is it possible to reduce the mixing time and economically use the time saved to increase production and, 2, what is the minimum time of mixing that will produce a concrete of satisfactory strength and uniformity. These are being made the subjects of investigations by the U. S. Bureau of Public Roads at the present time.

Laying a 10-Mile Concrete Road in Toledo, Ohio

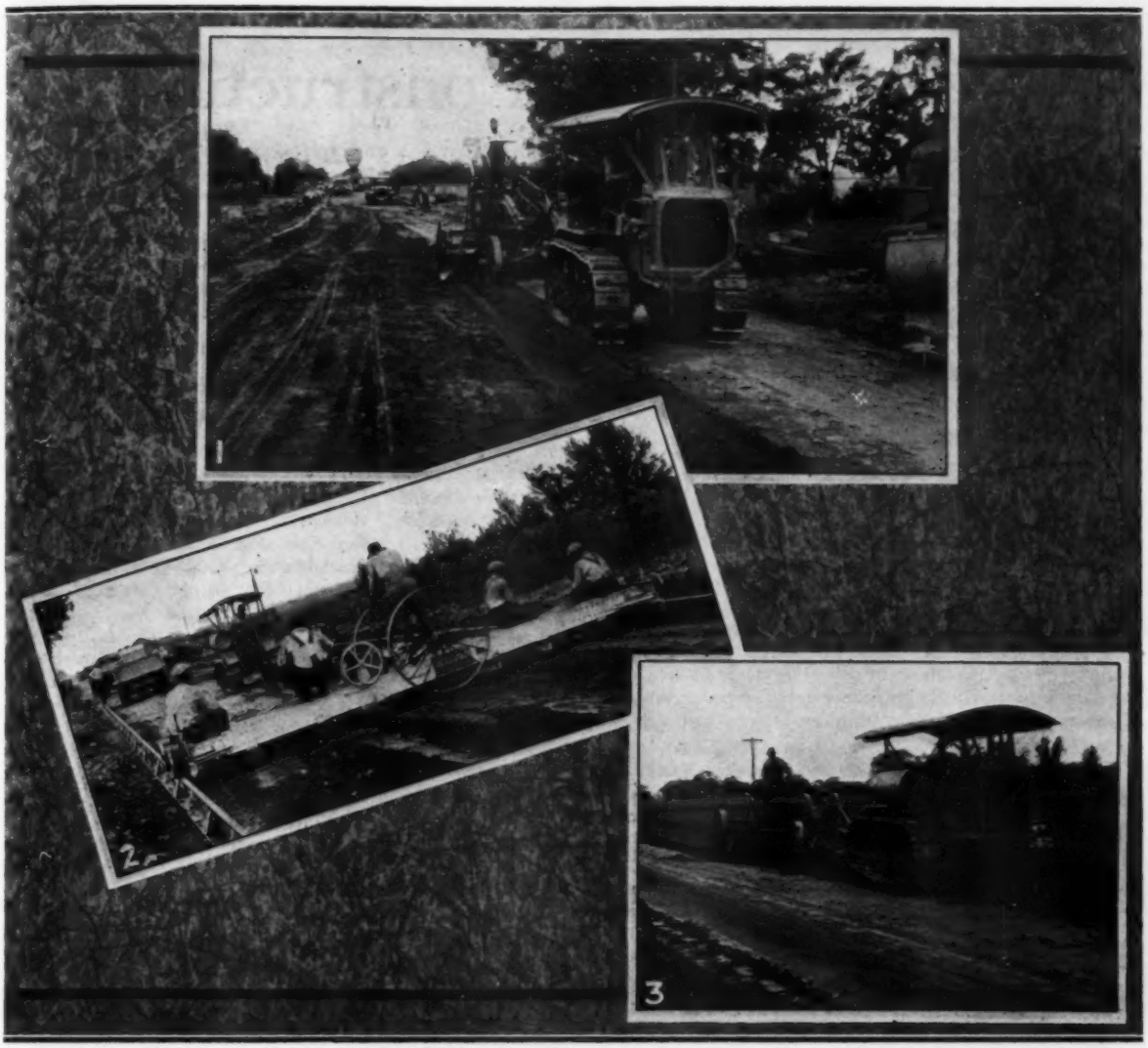
G. L. LaBoiteaux Used Sturdy Construction Equipment to Insure Completion of 10-8-8-10-inch Concrete Road 20 Feet Wide Between April 26 and October 5



EXCAVATION for the 10-mile concrete pavement on Central Avenue, 3 miles west of the city limits, Toledo, Ohio, on U. S. Route 20, was started by the G. L. LaBoiteaux Co. of Toledo on April 26, 1928, and on May 7, the first concrete was poured. The slab is of 10-8-8-10-inch section, 20 feet wide. Most of the road was opened to traffic by the middle of September and the entire road completed and opened on October 5.

This road is known as State New-Federal Route 20, of the Buffalo to Chicago Pike. It was formerly built of macadam, but has been resurfaced many times as it is one of the oldest roads in that section of the country. It was necessary for the contractors to rip up 14 inches of various layers of bituminous macadam with a Killefer heavy duty ripper behind a Caterpillar Sixty tractor to reach the prescribed grade. A deep drainage ditch on one side of the road was tiled and the old macadam shoved over into the ditch by a 10-foot blade grader pulled by a Caterpillar Sixty. This was later filled with a top layer of earth and rolled.

The G. L. LaBoiteaux Co. is known for its well-maintained construction equipment. On this job were a number of Caterpillar tractors employed in different capacities, including one Sixty, two Thirties and two 2-tons. As mentioned above the Sixty was used with the Killefer ripper to remove the old road. The major part of the rough grading operations was with a Caterpillar tractor and blade grader. The fine grading was done with an 8-foot blade grader hauled by a Thirty and the final subgrade was established with a Lakewood subgrader pulled by a Thirty.



CONSTRUCTION EQUIPMENT ON A 10-MILE CONCRETE ROAD IN TOLEDO, OHIO

1. Caterpillar Thirty with an 8-foot blade grader on fine grading ahead of the paver which can be seen in the background. 2. The same tractor pulling a Lakewood subgrader operating on the forms just ahead of the paver. Note the batch trucks waiting to back up to the paver as soon as the subgrader is out of the way. 3. A Caterpillar Sixty with a 10-foot blade grader shaping the shoulders about a mile behind the mixer. The tractor was used with a Killefer heavy duty No. 10 ripper for ripping up the old macadam prior to the laying of the concrete pavement

Batch trucks delivered the proportioned aggregate to the mixer backing over the completed final subgrade. After the concrete was cured a 10-foot grader was used to shape the shoulders or berms and this was compacted by the Sixty tractor over it, giving a sightly and economical job.

Chicago to Undertake Largest Single Building Operation

REPORTS from Chicago indicate that the Chicago Apparel Mart, the construction of which will begin in February, 1929, is to be the largest single building operation ever undertaken. It will have a gross floor area of 5,097,778 square feet and will require 74,000 tons of structural steel, and 12,000 tons of steel bracing for the erection of the skeleton of the building. The estimated quantities of other materials are 234,799 cubic yards of concrete, requiring 519,441 barrels of cement, 96,000 cubic yards of sand and 189,797 cubic yards of gravel. Approximately 15,500,000 bricks will be used, of which 5,000,000 will be face brick and the remainder hollow, common and pavers.

Poydras Street Coffee Terminal Opened

THE first bags of coffee to pass over the Poydras Street Green Coffee Terminal of the New Orleans Dock Board were discharged from the Steamship Salvation Lass of the Mississippi Shipping Company on October 3, 1928. Discharging began at 1 P. M. and the event attracted a large attendance of coffee importers, steamship officials, railroad representatives and other interested persons. This two million dollar project of the New Orleans Dock Board was described in CONTRACTORS AND ENGINEERS MONTHLY in the August, 1928, issue on pages 98-101. The Terminal is a two-story structure of reinforced concrete and steel built for the purpose of handling over 3,000,000 bags of coffee per year through the Port of New Orleans.

Who's Who in Construction

A Series of Reports from Active Contractors Published Monthly

BUS. VOL.—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

Key-Langston Construction Co., Murray, Ky. Organized August, 1926. Bus. vol. D. This is an equal co-partnership composed of B. E. Langston & R. W. Key. Major contracts: 1926, Murray State Auditorium (the largest school auditorium in Kentucky); 1927, Murray State Central Heating Plant, and Tupelo High School, Tupelo, Miss.; 1928, Crystal Springs Consolidated School, Crystal Springs, Miss. (largest consolidated school in Mississippi), and First Baptist Church, Mayfield, Ky., $185,000.

Fred L. Hartley, Salina, Kans., 121 N. 2nd Street. Organized 1917. Bus. vol. E. Major contracts: 1926, Bishop F. J. Tief Home in Concordia, Kans., R. J. Lawbengayer home and ten or twelve others; 1927, Lee Hardware building; 1928, International Harvester building. Member: Kansas Master Builders.

M. W. Watson

M. W. Watson, Topeka, Kans., Mulvane Building. Organized 1925. Bus. vol. D. This company was organized originally as M. W. Watson & Co., in 1923. The organizer was formerly State Highway Engineer of Kansas, and also was in the Engineering Department of the Illinois State Highway Department. Officers: M. W. Watson, owner. Major contracts: 1925, street paving in Wathena; 1926, street paving, Hill City, Kans., Atwood, Kans., Tonganoxie, Kans., and Albany, Mo., and combined road and street paving in Brown and Atchison Counties, Kans., and culverts in Thomas County, Kans.; 1927, street paving, Albany, Mo., Horton, Kans., Salt Creek Bridge, Osage County and Pratt Bridge, Shawnee County, Kans.; 1928, gravel roads in Jefferson and Geary Counties, Kans., earth roads and culverts in Jefferson County, Kans., and concrete paving on highways in Shawnee County, Kans. Member: American Society of Civil Engineers.

Whittaker & Diehl Co., Harrisburg, Penna., Union Trust Bldg. Branch Offices: Cape May, N. J.; Rahway, N. J. Bus. vol. B. D. L. Diehl and John F. Whittaker carried on business as co-partners from 1908 until 1924 when the company was incorporated under its present name. Officers: D. L. Diehl, President; John F. Whittaker, Secretary and Treasurer. Major contracts: Pittston Bridge over Susquehanna River, Pittston, Pa., $900,000; Lewistown Bridge over Juanita River, Lewiston, Pa., $400,000; Lindbergh Viaduct, Reading, Pa., $500,000; Birdsborrow Bridge over Schuylkill River, Birdstown, Pa., $400,000; Hamberg Bridge over Schuylkill River, Hamberg, Pa., $175,000; Rahway River Bridge, Rahway, N. J., $200,000; Cape May Bridge, Cape May, N. J., $130,000. Members: New Jersey Constructors' Association.

Wm. Goldsmith
General Manager

Woodcrest Construction Co., Inc., New York, 2511 Grand Central Terminal. Organized Sept., 1927. This company is an offshot of the Riverdale Construction Co., Inc., in operation since 1919. Officers: Fred Goldsmith, President; William Goldsmith, General Manager. Major contracts: 1926, Sewage Treatment Plant and Pumping Station foot of Canal and West Streets, New York, $400,000, a difficult foundation job 40 feet below and next to tidewater; 1927, Corona Train Inspection Shed for N. Y. C. Subway, $400,000; 1928, Station finish for N. Y. C. Subway Stations, $400,000, 155th, 163rd and 168th Street Stations on St. Nicholas Avenue, New York.

The Scully Co., Cambridge, Mass., 238 Main Street. Organized 1907. Bus. vol. B. This company was started in 1865, and engaged primarily in pile driving until approximately 1910. Since that time the business has been general contracting. Officers: James J. Scully, President; Frank P. Scully, Treasurer. Major contracts: 1925-26, Boston & Maine R. R. Co. office building; 1926-27, Pittsburgh Plate Glass Co.; 1927, National Biscuit Co.; 1926-27, Mack Motor Truck Co. Member: Building Trades Employers' Association, Master Builders Association, and A. G. C. of A.

The Kellam & Shaffer Co., Schenectady, N. Y., Maxon Road. Organized 1907. Bus. vol. C. This business was started in 1892 by A. F. Shaffer and N. J. Kellam as stone curb and sidewalk setters. In 1906 E. C. Shaffer joined the company which was incorporated under its present name in 1907. Officers: A. F. Shaffer, President; E. C. Shaffer, Vice-President; Ernest Shaffer, Secretary; N. Earl Kellam, Treasurer. Major contracts: 1926, 6 miles of concrete pavement on Western Turnpike in Schenectady County, $300,000, asphalt pavement in city of Schenectady, $300,000, city sewers, $100,000; 1927-28, Schenectady Saratoga concrete highway, $80,000, Schenectady city asphalt, brick, concrete pavements and sewers, $1,500,000. Member: A. G. C. of A.

Photo by Blank & Stoller, Inc.
Saul Horowitz
President

H. R. H. Construction Corp., New York, 9 East 40th Street. Organized 1924. Bus. vol. A. Officers: Saul Horowitz, President; Saul Ravitch, Secretary; Morris Heyman, Treasurer. Major contracts: 1926, 24-story loft, 519 Eighth Avenue, $1,500,000, apartment house, 944 Fifth Avenue, $750,000 addition of 6 stories on existing 12-story office building, 9 East 40th Street, $500,000, Bank of the United States, Brooklyn Branch, $250,000; 1927, apartment house, 820 Park Avenue, $750,000, Bank of the United States, Third Avenue Branch, $250,000; 1928, Bank of the United States, Burnside Branch, $200,000, apartment house, 170 Second

Avenue, $750,000, apartment house, 81st Street and Central Park West, $3,750,000, apartment house, 96th Street and Park Avenue, $1,000,000, all located in New York. Member: Real Estate Board of New York.

George W. Rogers Construction Corp., New York, 6 Church Street. Organized: August 27, 1926. Bus. vol. C. This company has operated under similar corporate titles for the past sixty years. Officers: Frederick B. Rogers, Chairman of Board; J. Rulon Miller, Jr., President; C. Aubrey Nicklas, Vice-President; W. P. Brandes, Vice-President and General Manager; George W. Rogers, Vice-President; Harry W. Grell, Secretary and Treasurer. Major contracts: Dock repair and construction work in New York Harbor and vicinity for the following companies: Consolidated Gas Co., Lehigh Valley R. R. Co., New York Central R. R. Co., French Line, Seaboard Sand & Gravel Co., Luckenbach Steamship Co., Erie R. R. Co., Cunard Steamship Co., New York, New Haven & Hartford R. R. Co., New England Steamship Co. Member: Associated General Contractors, War Memorial for Saint Paul's School, Concord, N. H.; and bank and office building for New England Trust Co., Boston. Member: Boston Building Congress.

Photo by Blank & Stoler, Inc.

C. A. Nicklas
Vice-President

Du Bois & Co., Pittsburg, Kans. Branch office: Joplin, Mo. Organized, May, 1910. Bus. vol. E. This company was organized in 1910 as a Missouri corporation by Chas. R. Du Bois, doing reinforced concrete building construction, then paving work from 1915 to 1917. Mr. Du Bois served as Captain of Engineers on construction during the War, and in 1919 the company was reorganized as a partnership doing road and city work in Kansas, Oklahoma and Missouri. It was changed to sole ownership in 1923. Officers: Charles R. Du Bois, Manager; Gardner Johnston, Secretary. Major contracts: 1925, paving at Webb City, Mo., and Pittsburg, Kans.; 1926, Missouri Highway in Barton County and Picher, Okla., 1927, paving and sewers in city of Joplin, Mo., Highway 66 in Cherokee County, Kans., and paving and sewers in city of Galina and Baxter, Kans.; 1928, paving in Crawford County, Kans., Joplin, Mo., and roads in Lawrence County, Mo. Member: Kansas Engineering Society, and Rotary.

Carolina Heating & Engineering Co., Durham, N. C., 318 Holland Street. Branch Office: Chapel Hill, N. C. Organized March, 1920. Business vol. D. This business was started by its present owner and there has been no change in organization since that time. The company specializes in heating and power piping. Officer: Wm. H. Rowe, owner. Major contracts: University of North Carolina, $300,000; Junior O U A M Orphanage, Lexington, N. C., $75,000; Watts Hospital, Durham, N. C., $30,000. Member: Master Heating and Plumbing Contractors Association of Durham and North Carolina.

W. Boyd Jones, Omaha, Nebr., 1060 Omaha National Bank Bldg. Organized: June, 1923. Bus. vol. E. Mr. Jones was manager for the Gilsonite Construction Co., Dallas, Texas, from 1910 to 1917, during which time this company erected the Adolphus Hotel and Annex and other large buildings in Texas. In 1917, Mr. Jones became associated as manager with the Home Builders, Inc., and erected the Logan Hotel, Union Pacific Shops and other large structures in Omaha. He remained with this firm until 1923 when he organized his own company. Officers: W. Boyd Jones, owner. Major contracts: 1926, freight house for Missouri Pacific R. R., Omaha, roundhouse for Burlington R. R., Omaha; 1927, newspaper plant for Omaha Bee News, Omaha, plant for Corn States Serum Co., Omaha; 1928, 68 buildings, including depots etc., in Wyoming for Union Pacific R. R. Member: Omaha Builders' Exchange, Chamber of Commerce.

Shamokin Lumber & Construction Co., Shamokin, Pa., 27 South 5th Street. Organized: 1865. Bus. vol. C. This company was established as Aucker Slayman Co., in 1865. In 1902 it was incorporated under the name of Shamokin Lumber & Manufacturing Co., and following a reorganization in 1919, the name was changed to Shamokin Lumber & Construction Co. Officers: E. G. Seiler, President; J. W. Kessler, Vice-President; W. U. Jury, Treasurer and Manager; W. Lloyd Snyder, Secretary. Major contracts: State Odd Fellows Home, Middletown, Pa., Majestic Hotel and Theatre, Tamaqua, Pa., West End National Bank, Shamokin, Pa., two grade schools and one junior high school, Coal Township school district, Shamokin, Pa., St. Stephens School, Shamokin, Pa., sunday school, Salem Reformed Church, Shamokin, Pa. Members: Pennsylvania Lumbermen's Association; Master Builders' Exchange, Lower Anthracite Region.

George B. H. Macomber Co., Boston, Mass., 38 Chauncy Street. Organized May, 1904. Bus. vol. B. For the past 24 years this company has, without reorganization, change in name or other corporate change, specialized in the erection of high class buildings, principally banks and office buildings, throughout New England. Officers: C. Clark Macomber, President and Treasurer; Luman W. Marsh, Vice-President; Charles E. Thrasher, Clerk of Corporation. Major contracts: 1925, Bank and office building for the Union Savings Bank of Boston; 1926, bank and office building for Old Colony Bank, Providence, R. I., and Boston factory branch of the Electric Storage Battery Co. at Boston; 1927, bank building for State Street Trust Co., Boston, and office building for Boston Consolidated Gas Co., Boston; 1927-28, Doctors' Building for the W. R. and A. R. MacAusland and State Street Trust Co., Trustees, Boston; and Four Dormitories, Four Master's Houses, Chapel and War Memorial for Saint Paul's School, Concord, N. H.; and bank and office building for New England Trust Co., Boston. Member: Boston Building Congress.

Clark & Smith, Inc., Quincy, Mass., 13 Temple Street. Bus. vol. D. This company was founded by Oberlin S. Clark in March, 1920. In March, 1923, a partnership was entered into under the name of Clark & Smith, which was incorporated in September, 1924. Officers: Ernest G. Smith, President; Oberlin S. Clark, Treasurer. Major contracts: 1928, sea wall and coal pocket for Old Colony Gas Co., factory for Boston Gear Works, factory for Thompson Wire Co., branch bank for Quincy Trust Co., plant for Warshaw's, Inc., cleaners, store and office building for Meyer Winer.

Ernest G. Smith
President

Oberlin Clark
Treasurer

Pennsylvania Construction Co., Scranton, Pa., 2nd floor, Comerford Bldg. Branch office: 1517 Oram Street, Scranton, Pa. Organized: July 1, 1928. Officers: George Dickelnick, President; John J. Garun. Major contracts: construction of a system of sanitary sewers for the city of Scranton.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

When the Steam Shovel Sets Fire to Nearby Property

The degree of care required by a contractor in operating a steam shovel, to prevent injury to nearby property through the escape of fire, was mentioned by the Kentucky Court of Appeals in the case of Bryant vs. Ellis, 300 S. W. 610.

First, the court ruled, however, that a local statute, requiring installation of spark arresters and granting immunity from liability where the statute has been complied with, applies to railroads only, and not to contractors' steam shovels. The court then says:

"Of course, the defendants had a lawful right, in the grading of this highway, to use a steam shovel, if they saw fit to do so; but, when they did so, it was incumbent on them to use ordinary care to avoid throwing sparks therefrom and setting fire to adjoining property. Fire is a dangerous agency, and the ordinary man is quite careful in the use of it. Parties using machinery operated by steam must use fire to generate the steam; but in the use of such machinery, they must use care commensurate with the danger to avoid communicating the fire to adjoining property. In determining the degree of care required in such cases, regard must be had for the character of the season, the weather, the prevailing winds, and the nature of the material near which they are working. Thus ordinary care in a plowed field during a downpour of rain would be negligence during a severe drought and in the neighborhood of dry fodder, stubble, grass, or other tinder. This care is measured by that degree of caution which a man of ordinary prudence would exercise under the circumstances."

Binding Effect of Mistake in Quoting Figures

Usually, it is the contractor who gets the worst of a mistake in a computation of compensation for service. But "the shoe was on the other foot" in the case of Fidelity & Casualty Co. vs. Waugh, 300 S. W. 592, decided by the Kentucky Court of Appeals December 6, 1927.

Waugh, a highway contractor, applied for and secured a necessary bond covering the work. The surety company's representative quoted $156 as being the premium. That was a mistake, for the computation ought to have been made on a basis of 1½ per cent of the price of the work, rather than upon the amount fixed in the bond. The premium should have been $773. But, when the company sought to increase the premium charge, the contractor objected. The work was completed and then the surety company sued to recover the excess of the premium that should have been quoted above that quoted.

Because there is a statute in Kentucky forbidding surety companies to unjustly discriminate between different clients, the court held that, by taking prompt steps, the surety company could have secured release from the bond, but that it could not omit to do this and then, after the contract work was done, compel the contractor to pay a premium that he never agreed to pay. The court applied the general rule that where a mistake is made by an agent it should ordinarily fall upon his principal, rather than upon an innocent third party.

Breach of Building Contract Was Unexcused

When sued for damages for failing to build an addition to a college, the contractors tried to avoid liability on two grounds: (1) They had not consummated the contract by securing sureties on bond as required by the contract. (2) They made a mistake in bidding on the job, in calculating costs. In an opinion handed down March 7, 1928, the Texas Court of Civil Appeals decided in this case—State vs. Scholz Bros., 4 S. W. 2d Series, 661—that both of these defenses were leaky. But, apparently, the mistake made in bidding was not so gross that the owner should have known that a mistake had occurred because the courts seem to be quite well agreed that an owner who knows that a mistake has probably been made commits a sort of constructive fraud when he accepts the bid and attempts inequitably to enforce it. So far as the following language of the court runs counter to this last stated proposition, the Texas court's decision is unsound:

"A mistake in arithmetic made by a party bidding on a contract to erect a building, such mistake not having been induced by the other contracting party, but arising solely on account of the ignorance or negligence of the bidder, has never been recognized as an excuse for breach of a contract. Such fragile and unreasonable excuse can never be entertained to justify a breach of a contract."

As to the other defense, the court said: The contract "was duly signed and executed by the parties, and appellees [the contractors] duly signed the bond which bound them to execute the contract. That bond was as binding on them as though signed by a dozen sureties."

Time Cards Were Legal Evidence of Work Done by Contractor

Plaintiff contractor installed caissons to carry the foundation of a building, and sued to recover for extra work and material furnished. Reviewing judgment in plaintiff's favor, the Massachusetts Supreme Judicial Court was called upon to determine whether or not at the trial it was error to admit in evidence time cards covering the job. Holding that the time cards were properly considered, the court said (Charles R. Gow Co. vs. Marden, 160 N. E., 319, decided March 5, 1928):

"These time cards were kept by the plaintiff's timekeeper and clerk. It was a part of his work to keep an accurate account of the work done by the plaintiff's employees. The cards were kept in the usual course of business and as a part of the time clerk's regular work, and were made from personal knowledge, the entries being made on the day the work was done. The records on the back of the cards contained measurements made by the foreman and given to the timekeeper who, with the foreman, examined those items and measurements. The timekeeper was witness at the hearing . . . and the findings . . . as to the details of the time cards, . . . were based on the testimony of the timekeeper.

"The cards were admissible at common law. The entries were in the usual course of business. The timekeeper himself saw the men at work, and the measurements made by the foreman were made in the presence of the timekeeper."

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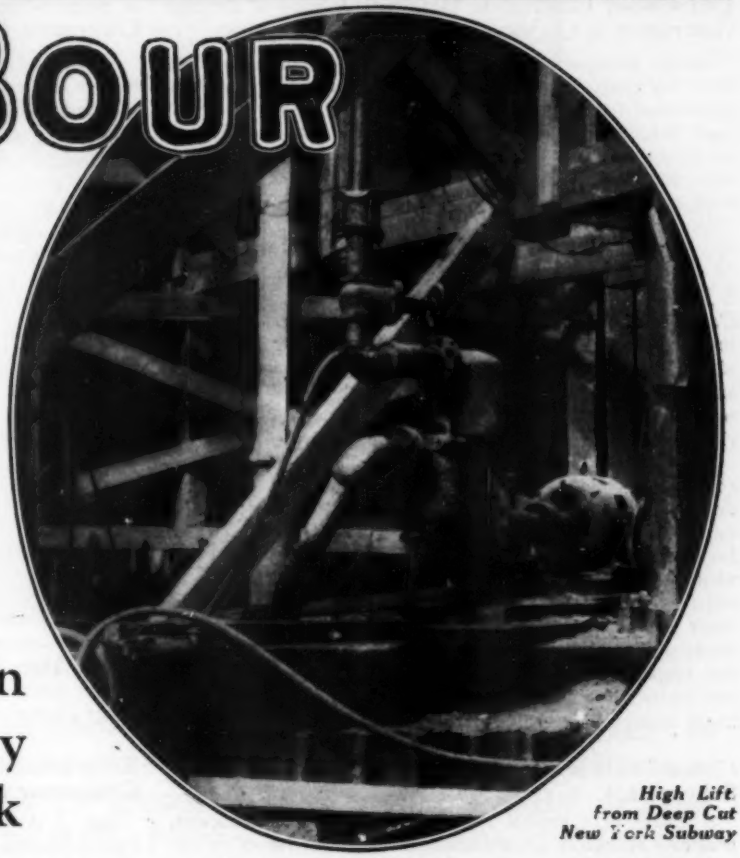
Meet all the varied and difficult requirments in New York Subway construction work

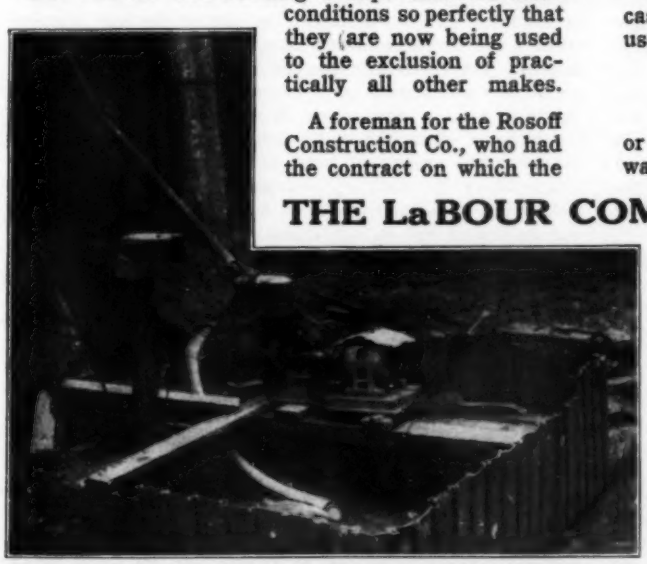


High Lift from Deep Cut New York Subway

IT is hard to imagine a more trying series of pumping conditions than are encountered in the construction of the subways of New York City. Dirty water—often mixed with sewage—has to be lifted from deep cuts. Often the water supply is intermittent—breaking the prime of ordinary pumps repeatedly.

But LaBour Self-Priming Pumps meet all these conditions so perfectly that they are now being used to the exclusion of practically all other makes.

A foreman for the Rosoff Construction Co., who had the contract on which the accompanying photographs were made, told the writer "I've been on this kind of work for 15 years and have always wished I could find a pump that would do just the kind of work your pumps do. They fill the bill exactly."



Another New York Subway Installation

Self-Priming

This is an inherent function of the impeller and casing design. No floats, valves or other devices are used. The impeller is the only moving part.

It actually pumps air—

or water, or both, intermittently. Guaranteed to lift water 20 feet on the suction side at or near sea level.

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LaBOUR PUMPS

are built in a range of sizes, for stationary or portable installation. Motor or gas engine drive. Carried in stock by responsible dealers.

Send for Bulletin 29-C.

Unforeseen Conditions Did Not Justify a Bridge Contractor in Quitting and Suing for Damages

Bridge plans showed approximate foundation elevations above sea level. The specifications stated that these elevations represented foreseen conditions, but that, if the actual elevations necessary to obtain foundations satisfactory to the engineer should differ from those shown on the plans, an allowance would be made for or against the contractor at an equitable unit price.

Construing this clause of the specifications, the Georgia Supreme Court decided in an opinion handed down February 14, 1928, in the case of Decatur County vs. Praytor, Howton & Wood Contracting Co., 142 S. E. 73, that development of the fact that the estimated elevations were inaccurate and that the foundations could not be constructed in conformity to the plans did not justify the contractor in abandoning the job and claiming damages on the ground that there was an implied warranty that the foundations could be constructed at the elevations shown on the plans. The court said:

"The contractor was as much bound by its proposal and contract to build the piers upon different and lower foundations, if the foundations shown on the plans were unsatisfactory to the engineer, as it was to build these piers on the foundations shown in the plans. If the contractor did not wish to run the risk of having to furnish the additional material and do the additional work necessary to erect them at lower elevations than called for in the plans, because of its financial inability to do so, it should not have submitted this proposal and entered into the contract which required the contractor to erect them on different foundations which might involve additional expenditures for material and labor."

Clause in General Contract Did Not Apply to Subcontract

A clause in a general contract for building construction, providing against an allowance to the contractor for extras not authorized in writing, does not bind the subcontractor if there is no repetition of that provision in the subcontract, according to a decision handed down April 27, 1928, by the Indiana Appellate Court in the case of Deutsch vs. Schmidt, 161 N. E. 855.

Hardpan Excavation Was Not "Earth" Excavation

A contract to excavate for and construct a water conduit provided unit prices for four classes of excavation: 30 cents per cubic foot for "earth," $1 for loose rock and shale and $3.50 for solid rock. To the surprise of both parties, hardpan in large quantities was encountered. The engineer insisted on classifying hardpan as "earth," and thereby the case of Walbridge-Aldinger Co. vs. Rudd, 26 Federal Reporter, 2d Series, 636, found its way to the United States Circuit Court of Appeals, Eighth Circuit. By a vote of two to one the three judges sitting in the case decided that the engineer's classification was unfair and must be set aside. The majority opinion filed May 7, 1928, says:

"We fail to see . . . how the contractor is bound under the circumstances presented to accept a clearly inequitable decision, and one imposing upon him a direct pecuniary hardship and loss not contemplated by the agreement. The contract assumed that no other material than that specified would be encountered, so gave the engineer the right to classify all materials within one of the four classes provided for. . . .

"There is testimony to the effect that material of this nature on other jobs had been classified by the city as loose rock. . . . There is no more justification for giving the lowest price classification to this material, which, according to the evidence, was unusually difficult and expensive to handle, than there is for classifying it as rock, etc. . . .The classification provision could have had only one object, to wit, to insure the contractor reasonable compensation, no matter what material was encountered."

A Supervising Engineer Cannot Relieve a Contractor from Contract Obligations

Every contractor should know that a supervising engineer has no implied authority to waive performance of conditions specified in the particular contract under performance.

In a case decided April 20, 1928, by the New Jersey Court of Chancery (Shields vs. Greater Cape May, Inc., 141 Atl. 459) it appeared that a dredging contract required deposit of the dredged materials upon certain areas. The contractor, complying with directions of the engineer, dumped the materials elsewhere.

The court concluded that the contractor was entitled to a fair price for dredging the materials and dumping them conveniently, but that the owner was entitled to a rebate on account of the failure to deposit the materials as required by the agreement. The court remarked:

"Within these specified areas the engineer had discretion in making the fill. His choice to dump the material on the waste land of Two Mile Beach and in the thoroughfare instead of filling in lots for market in low areas Nos. 2 and 1 furnishes no excuse for the non-performance of this special feature of the contract. . . . Low areas No. 2 and No. 1 were available for all the materials improperly deposited elsewhere. The contract price of 9 cents per cubic yard included fill as well as the excavation. It appears in evidence that 6 cents per cubic yard was a fair price for dredging and dumping the materials conveniently, and an allowance will be made at that figure. There is nothing in the evidence to show that injury to the company in failing to deposit the material in the places selected exceeds this rebate of 3 cents per cubic yard."

Enlargement of Caisson Dimensions Entitled Contractor to Increased Pay for Extra Excavation

One of the points involved in the case of Charles R. Gow Co. vs. Marden, 160 N. E., 319, decided by the Massachusetts Supreme Judicial Court March 5, 1928, was whether or not plaintiff contractor was entitled to extra pay for additional excavation entailed through enlargement of caissons constructed for the foundation for a building. Upholding the right to extra pay, the court said:

"Under the fifth paragraph of the contract, if it became necessary to increase the bell sizes or otherwise increase the caisson dimensions, the defendants were to pay the plaintiff for the increased volume at a rate proportionate to the price named in 'item 1.' In some instances the size of the base was increased and this necessitated extra excavation and additional cement. The defendants contend that the caisson is merely a concrete pile resting on a concrete base; that the words 'increase . . . dimensions,' as used in the contract, mean the increased dimension of the concrete pile or base, and do not mean the amount of labor necessary to create the displacement or the work of excavating and back filling. The installation of the caissons could not be made unless the soil was excavated, and on conflicting evidence the auditor [trial judge] found that the words 'caisson dimensions' included the necessary work incident to the installation of the caissons. We do not agree with the defendants' contention. By paragraph 2 of the contract, the plaintiffs were 'to start our work from the grade of the existing basement floor, excavate the caissons to the sand and/or gravel shown by our borings.' These words are not limited to the concrete structure; they include the installation, and the removal of material was a part of this work. It would be too narrow a construction and contrary to the intention of the parties, to limit these words to the amount of concrete, with no allowance for the preliminary work. By paragraph 5 the 'increased volume' was to be paid for 'at a rate proportionate to the price named in item 1.' That price included excavation as well as cement, and by reference to 'item 1' the excavation as well as the concrete was to be taken into account."

n-857-L

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Where fuel is scarce---and water is scarcer---steam power has no chance. With gasoline the most easily transported fuel, a Waukesha "Ricardo Head" Engine that uses little fuel and less water, will see you safely through the toughest job with time to spare. Even under such conditions you can collect your bonus. Insist that your equipment be powered by Waukesha.

Industrial Brown Hoist with full knowledge of these facts and jealous of their reputation have standardized on Waukesha power. In more than thirty different kinds of industries and in every class of contractors' machinery there is some Waukesha powered equipment to meet your needs. Make Waukesha power your standard.

"L-Head Engines—They take better care of themselves."

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Exclusive Builders of Heavy Duty Gasoline Engines for Over Twenty Years

Construction Industry News

The Thew Shovel Co., Lorain, Ohio, has recently added the following men to the sales force of its various branches: J. H. Devine and Malcolm Jones, Chicago office; A. L. McLain, Dallas office; G. D. Laurell, Atlanta office; H. S. Beale, New York office and R. S. Delp, Philadelphia office. The following is a list of new sales and service representatives for the Thew Shovel Co., in their respective territories: Southern Tractor Co., Montgomery, Ala.; North Carolina Equipment Co., Raleigh, N. C.; Hall Perry Machinery Co., Butte, Mont.; Paragon Supplies, Ldt., Vancouver, B. C., Canada; Jennison Machinery Co., (successors to Smith Booth Usher Co.), San Francisco, Calif.; R. G. Moeller Co., Detroit, Mich.

E. I. Du Pont De Nemours & Co., Wilmington, Delaware, has just completed a new motion picture entitled "Driving the Longest Railroad Tunnel in the Western Hemisphere." It is printed on 35 mm. safety stock, is one reel in length and requires 15 minutes for showing. The picture tells the story of the problems which were encountered in boring the Cascade Tunnel through the mountains in the state of Washington.

The Nordberg Mfg. Co., Milwaukee, Wis., and Symons Bros. Co., both manufacturers of crushers, have consolidated. Among Nordberg's products are the Nordberg-Butler shovel and air-operated machines for loading underground in drifts and tunnels, the Nordberg track shifter, used for shifting track in many mines and quarries, and the Symons cone crusher has also been produced at the Nordberg plant. The Symons organization manufactures the Symons horizontal disc crusher, and the vertical disc crusher. The consolidation permits of a more advantageous use of the exceptional manufacturing facilities of Nordberg. The crusher department will be transferred to the main office of the Nordberg Manufacturing Co. at Milwaukee, and branch offices will be continued in New York and Los Angeles.

The Alexander Milburn Co., 1416-1428 North Baltimore St., Baltimore, Md., has announced the appointment of S. W. Perry of Monmouth, Ill., as its sales representative to travel in the Middle Western territory. Mr. Perry formerly represented the DeVilbiss Co., Toledo, Ohio, and has long been identified with the paint spray, automotive, welding and cutting, portable light and engineering equipment fields.

The Koppel Industrial Car & Equipment Co., Koppel, Pa., has announced the appointment of H. E. Chilcoat as Manager of Sales, Air Dump Car Division.

The Erie Steel Construction Co., Erie, Pa., has opened a Chicago office at 231 Engineering Building, 205 West Wacker Drive, for the sale and service of Erie Aggre-Meter plants and Erie clamshell buckets. O. H. Watson is in charge.

The Novo Engine Co., Lansing, Mich., has announced the appointment of the Joe Lyons Machinery Co., Little Rock, Ark., as exclusive distributor for Novo hoists, engines and pumps for the entire state of Arkansas.

The Walter A. Zelnicker Supply Co., 511 Locust Street, St. Louis, Mo., has announced that Spencer S. Swasey of Chicago has joined its organization as Manager of the Equipment Department. Mr. Swasey was for twelve years with the George D. Whitcomb Co., manufacturers of Whitcomb locomotives, the last six of which he was in charge of sales.

The Trackson Co., 500 Clinton St., Milwaukee, Wis., on September 27 announced the appointment of the following Western distributors for Trackson Full-Crawlers, loaders and shovels for McCormick-Deering tractors: B. Hayman Co., Inc., 118-128 No. Los Angeles St., Los Angeles, Calif.; O. R. Peterson Co., Inc., 21st & Alabama Sts., San Francisco, Calif.; Polson Implement Co., Seattle, Wash.; and Zimmerman-Wells-Brown Co., Foot of Sheridan St., Portland, Ore. Additional distributors in southern territory have been announced also, including: Dealers Equipment & Implement Co., P. O. Box 2281, DeSoto Station, Memphis, Tenn.; R. L. Stockard & Son, 2302 Charlotte Ave., Nashville, Tenn.; Evans Implement Co., 569-71 Whitehall Street, Atlanta, Ga.; F-D Equipment Co., 4219 East Grand Ave., Dallas, Texas; Industrial Tractor and Equipment Corp., 409 North 5th St., Richmond, Va.; Industrial Machinery Co., 1717 Main St., Kansas City, Mo.; and Southern Equipment Co., Inc., 501 North Alexander St., New Orleans, La. The Motor Power Equipment Co., Ford Road and River Blvd., St. Paul, Minn., has also been appointed a distributor for the Trackson Co. Recently appointed eastern distributors are Industrial Tractor Sales Co., Inc., 500 Fallsway, Baltimore, Md.; E. B. Kelly Co., N. Broadway, Box 22, Albany, N. Y.; W. B. May, Inc., 41 Perry St., Buffalo, N. Y.; Truck-Tractor Equipment Co., 460 Neilston St., Columbus, Ohio; Tractor & Equipment Co., 520-522 Passaic Ave., Newark, N. J.; Brinker Supply Co., 905 Clark Bldg., Pittsburgh, Pa.; and Service Supply Co., 20th and Venango Sts., Philadelphia, Pa.

The National Paving Brick Manufacturers Association has announced that its offices in the National Press Building at the southeast corner of 14th and F Streets, Washington, D. C., are now open. The National Press Building is the newest and best office building in Washington and houses practically all of the Washington correspondents of the larger newspapers of the country. The American Road Builders Association, the American Association of State Highway Officials and several other national organizations are also located in the building.

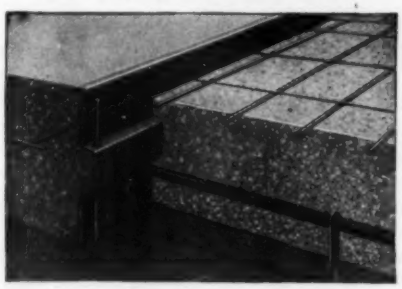
The Lidgerwood Manufacturing Co., Elizabeth, N. J., has announced the appointment of the Tidewater Supply Co. of Norfolk, Va., operating a branch office at Columbia, S. C., as sales agents and also William Hamilton, Ltd., Peterborough, Ont., with branches in Montreal, Vancouver and New Glasgow, Nova Scotia, as Canadian representatives. William Hamilton, Ltd., is also represented in Winnipeg by Kipp-Kelly, Ltd., which handle their sales in Manitoba.

The Koehring Co., Milwaukee, Wis., manufacturers of pavers, mixers, gasoline shovels, cranes and draglines, has discontinued the manufacture and sale of its present model 27-E paver, pending the announcement of a new 27-E model which will shortly be placed on the market. The Koehring Co. announces that its sales representatives stand ready to see that every need of the paving contractor is taken care of, should his work require a new paving mixer between this time and the first of the year.

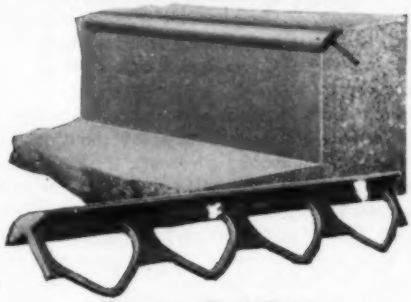
Wemlinger, Inc., 149 Broadway, New York, announces the opening of a western office at 228 No. LaSalle Street, Chicago, Ill. under the direction of Alexander Mayer. Mr. Mayer is thoroughly equipped to advise contractors on matters connected with steel sheet-piling and to render the many services which Wemlinger, Inc., aims to give its customers.

Approved Materials *for* Roads and Pavements

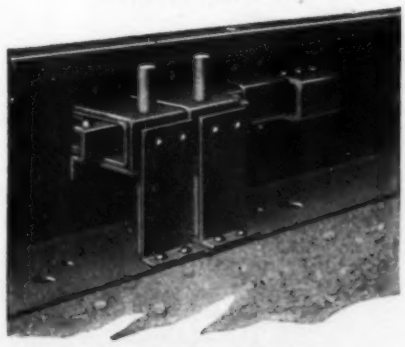
Truscon Welded Steel Fabric



Truscon Contraction Joints



Truscon Curb Bars



Truscon Road Forms

TRUSCON has identified itself from the beginning with advanced methods of road construction and has brought to the practice of modern road building both ideas and products which are now accepted as standard wherever permanent highways and streets are built.

Truscon Welded Steel Fabric, a steel mesh concrete reinforcement for roads. More economical and more effective than additional thickness of concrete. In rolls or road-size sheets.

Truscon Curb Bars are curb edge protectors and curb reinforcement of the most approved type. They insure against breakage and improve curb appearance.

Truscon Construction Joints are dowel-shape members that serve to part concrete slabs and allow expansion and contraction without destructive effect to the road slabs.

Truscon Road Forms represent the highest development in such equipment. Simple, durable, perfect in alignment, and with a special joint that positively prevents joint-sag.

TRUSCON STEEL COMPANY, YOUNGSTOWN, O.

REINFORCING STEEL DIVISION

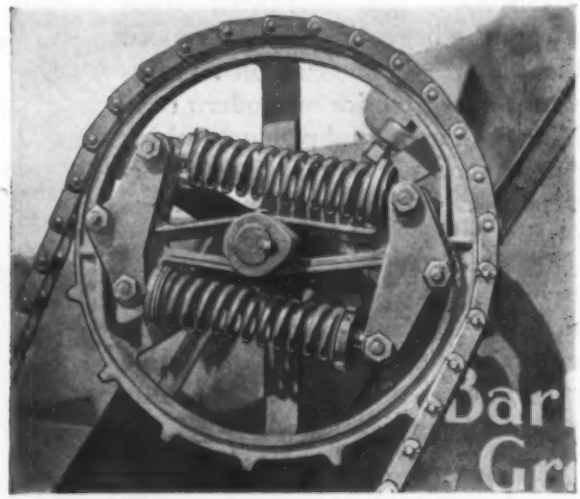
Warehouses and Offices in All Principal Cities

TRUSCON

PRODUCTS FOR REINFORCING ROADS AND PAVEMENTS

A New Overload Release Sprocket for Loaders

AN automatic overload release sprocket for large and small bucket loaders and coal loaders, has been announced by the Barber-Greene Co., Aurora, Ill. This release sprocket completely protects the machine against all strains on the bucket line and is superior to the safety breaking bolt which has been the usual method of avoiding strains on these machines.



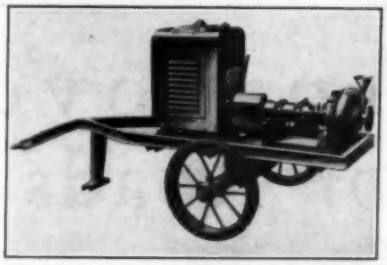
The New Barber-Greene Safety Sprocket Release

The sprocket, as illustrated, has two main elements, the outside race and the inside springs. The chain runs around the sprocket teeth on the outside of the race. The race itself has two raised parts which are in contact with the two rollers of the springs. The spring part is keyed to the shaft. Ordinarily the pressure of the spring rollers against the raised part of the race is sufficient to make the entire sprocket turn together, thus turning the head shaft at the bucket line. When a large boulder or other big solid object tends to stop the bucket line, the springs compress, thus allowing the sprocket to run and the head shaft to stand still. Every half revolution thereafter, the spring rollers come in contact with the raised part of the race and force is put on the bucket line. Usually this will free the object causing the trouble and the machine goes on running.

If the trouble remains, however, the only problem is to remove the rock and the sprocket is in running position again. This is practically the same sprocket that has been used on the Barber-Greene vertical boom ditcher and is a great step over the "safety pin" as it does not hold the machine up even for the length of time required to fix a pin. It is better than the slipping clutch or belt as there is no appreciable wear and the whole power is put on the bucket line every half revolution after the bucket line is caught. The springs may be quickly adjusted in tension to suit the conditions of the kind of material to be loaded.

A Contractor's Pump of Manganese Steel

A PORTABLE contractor's pump in which all wearing parts, including the shell, impeller and discs, are made of wear- and abrasion-resisting manganese steel, has been announced by the American Manganese Steel Co., 333 No. Michigan Avenue, Chicago, Ill. This pump is built with



The Amsco Portable Contractors' Pump

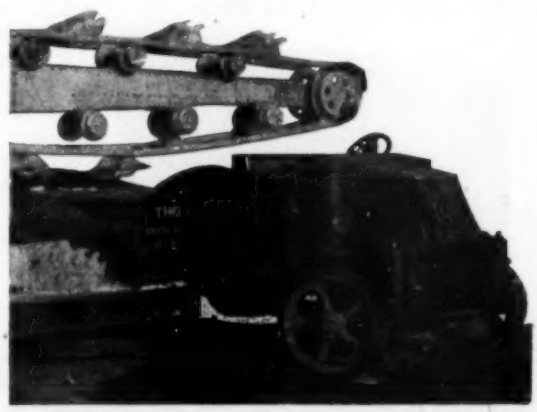
2-, 2½- and 3-inch discharge, to take care of various sizes of pumping jobs, and is mounted with its gas engine on heavy 3-inch electric welded channels. It is fitted with a pintle hook for convenience in towing the pump from place to place. Spring shock absorbers are mounted on the axle to cushion any jars received in transit. The axles have roller bearings, and the trailer unit is mounted on rubber-tired wheels to insure easy handling.

A heavy-duty gasoline engine of ample size is provided and connected to the pump unit through a clutch and flexible coupling. The entire unit is securely fastened to the frame, making a neat and compact piece of equipment.

Features of Heavy Duty Trailers for Moving Construction Equipment

THE frame of a heavy duty trailer for moving construction equipment is its backbone. It is therefore essential that it be the strongest part of the assembly. If the frame members sag or bend, then tires, wheels, springs and bearings are subjected to unnatural racking strains. The construction of Rogers trailer frames made by Rogers Brothers Corp., Albion, Pa., safeguards against these difficulties. The outside members consist of two channels strongly riveted back to back with a heavy plate between. The center members are Bethlehem H-beams giving far more strength than an I-beam of corresponding depth.

In a trailer frame, the longitudinal members only carry the load. Cross members simply add weight without increasing the carrying capacity. In Rogers gooseneck trailers, there are no cross members in the floor system except at the rear to carry the axle assembly. In the 28-ton trailer the outside member on each side is made up of two 12-inch, 30-pound channels with a 12 x ⅜-inch plate riveted between, giving a member weighing 75 pounds per foot. These two outside



Truck Attached to Rogers Semi-Trailer Showing Rear Wheels Passing Under the Short Coupled Gooseneck

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ACCURACY
in Neptune-built
Meters
The SYMBOL of SUSTAINED ACCURACY
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That every disk may run true...
Diamond-pointed cutting tools finish off the surface of the balls as well as the surfaces of the flat disks on which they are assembled. And micrometers, indicating gauges and ring-gauges check the accuracy of every part both before and after disk assembling. This thousandth-of-an-inch accuracy in every step of Neptune manufacture insures sustained meter accuracy worth thousands of dollars more revenue to every water works official who uses them.
Of Trident and Lambert meters, well over 4,500,000 made and sold the world over.
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Yesterday — TODAY—Tomorrow
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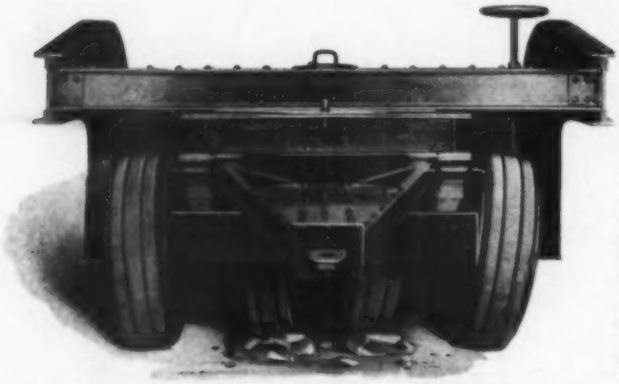


Front Truck of 8-Wheel Rogers Trailer Showing Rocking Axles

members alone are capable of carrying the rated capacity of the trailer. The 28-ton trailer has five 8-inch Bethlehem H-sections for center members and these five members are also collectively capable of carrying the rated capacity of the trailer. This construction is necessary because in loading a heavy steam shovel the load by means of the crawler treads comes on the two outside members, whereas the bulk of the weight of a transformer or similar concentrated load comes on the center of the trailer.

The gooseneck construction has been developed through a process of evolution during which front constructions of various kinds have been developed and abandoned for more advanced construction. The load over the fifth wheel is transferred to the gooseneck side plates by means of cross members of suitable size and capacity. The goosenecks are made up of plate sections reinforced with angles and gradually increasing in width to a point where they are attached to the outside frame members. Each side member consists of two channels between which is a full length plate which is also riveted to the gooseneck side plate. The Rogers gooseneck is built to the full width of the trailer to permit framing the outside girders to the gooseneck and give a direct lift to these important members. This causes the outside members to carry their portion of the load instead of transmitting it back to the center members. This type of construction also permits a 2-foot shorter wheel-base, thus reducing the span of the carrying members and consequently increasing their load carrying capacity.

The moving of loads of high tonnage involves conditions more severe than encountered in any other kind of hauling. This has led to the development of the rocking or oscillating axle in Rogers trailers. The rear wheels are mounted on axles which rock, permitting the tires to conform to the normal crown of the road or to bumps and depressions sometimes encountered. This distributes the load equally over all tires rather than on the inside tires, as is the case where wide dual wheels are used on a full width axle. Thus maximum and equal wear is obtained from all tires.

THE ROAD SHOW
CLEVELAND, OHIO
JANUARY 14-18, 1929

Countless exhibits of the very latest developments in construction machinery.

Don't Miss It

A Truck Mounted Snow Plow

CITIES and counties in the snow belt are now facing the annual problem of keeping city streets and county roads open for urban and interurban traffic. The same problem also faces many contractors who wish to continue certain phases of construction work during the winter. Many cities and towns also hire contractors' trucks which are not engaged in construction work to enlarge the municipal fleet in emergency.

The Gettleman Hi-Speed snow plow, manufactured by the Heil Co., Milwaukee, Wis., has been developed to overcome objections and problems created by some of the earlier blade plows. These Hi-Speed plows are placed on the highway as soon as the snow storm begins and, if the fall is heavy, the plows stay on the job 24 hours per day until the storm subsides and the highways are cleared. Not only is this method of attacking the storm less costly, but the highways are actually open all of the time, the full width, instead of being blocked for days following a storm.

Any trucks of two tons capacity or larger can handle a Gettleman snow plow at 20 miles per hour or faster. Dry snow has been cleared with a 2-ton Gettleman-equipped truck traveling at 35 miles per hour and wet snow at a slower speed, depending on the depth of the snow. Snow that weighs 45 pounds per cubic foot is considered wet. Traveling in wet or dry snow at the speeds mentioned the plow is designed so that the snow will run up the curved blade in a sheet and spread out over the roadside and into the adjoining fields.

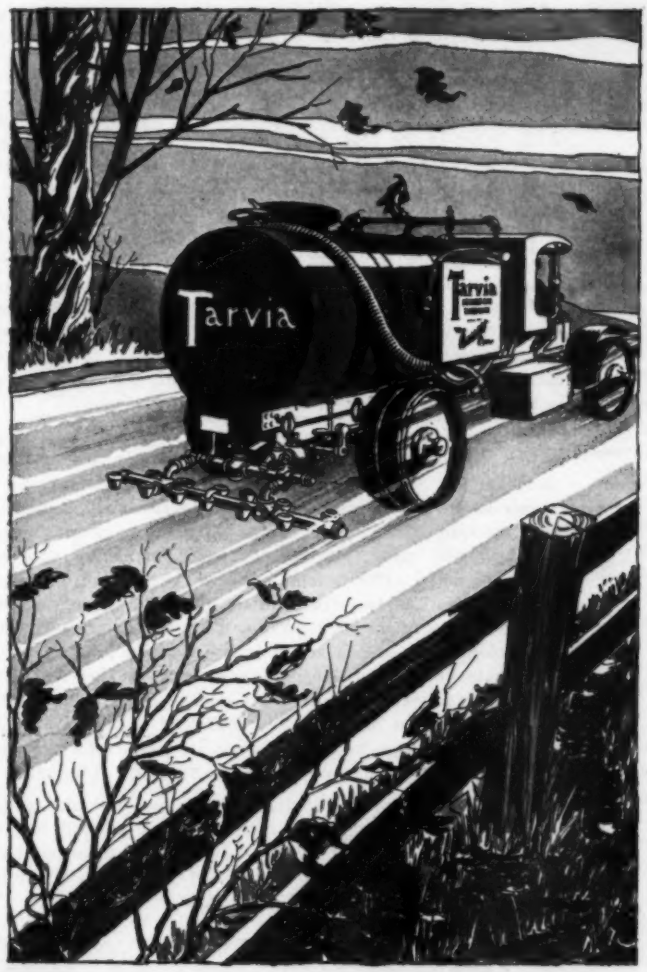
The Gettleman Hi-Speed snow plow is made in 9-foot lengths for 1½- to 2½-ton trucks and in 10-foot lengths for 3-ton trucks and larger. All blades are 38 inches high. Steel plate, 3/16-inch thick is used for the blade. The cutting edge is made of high carbon steel and the blade is reversible, doubling the life of the plow. The blade-supporting arrangement is sturdy. Tension springs are easily adjusted to plowing conditions. All castings are electric steel, thoroughly annealed and machined. The cab control mechanism for raising and lowering the plow blade is light but sturdy in construction and easily raises the blade to the carrying position.

The discharge edge of the plow extends a foot beyond the truck wheels. Thus, the pressure on the snow on the offset position of the blade tends to make the truck nose into the

A Gettleman Snow Plow Attached to the Front of a Heavy-Duty Truck

323

It's not too late—



ALTHOUGH the season for road building and repairs is nearly over, you can still complete that urgent job which needs doing before winter sets in.

Barrett's speedy and dependable service will help you.

Take advantage of the few favorable days remaining—and the availability of Tarvia and Barrett distributors—to complete your program.

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Youngstown						Rochester

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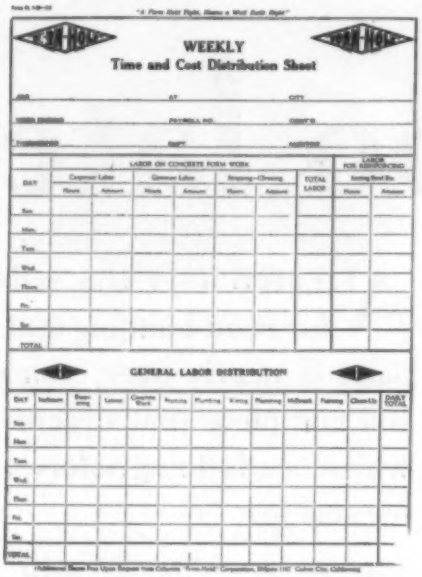
snow rather than pull away from it. This makes it possible for the truck to stay on the pavement and still clear the snow beyond the edges of the concrete.



WEEKLY
Time and Cost Distribution Sheet

One Side of the "Form-Hold" Time Sheet

Time Sheets for Contractors

FROM experience with the building trade, the Concrete "Form-Hold" Corp., Culver Bldg., Culver City, Calif., has formed the opinion that not over ten contractors out of one hundred actually know the cost of the various departments of building they engage in. There are many who do not know what it actually costs to build forms, to handle excavating, to install steel reinforcing, and because of this, the Concrete "Form-Hold" Corp., has prepared a time sheet with the idea that contractors using it in keeping the time of their workmen will have the desire and inclination to turn the sheet over and segregate the cost of the building on the back of the sheet which is furnished free.

The face of the weekly time and cost distribution sheet has space for the name and location of the job, the date, payroll number and the name of the contractor, the time-keeper, superintendent and auditor. There are spaces for the names of 26 laborers followed by 7 columns, one for each day of the week. The remaining columns take care of total time, hour rate, total pay, deductions and net amounts. The reverse of the sheet contains additional columns for labor on concrete form work, covering carpenter labor, common labor, stripping and cleaning, other columns for reinforcing, covering the setting of steel and also a general labor distribution form covering inclosure, excavating, layout, concrete work, framing, plumbing, wiring, plastering, millwork, painting and clean-up. These sheets may be secured without cost by readers of CONTRACTORS AND ENGINEERS MONTHLY by writing to the Concrete "Form-Hold" Corp., Culver Bldg., Culver City, Calif., and mentioning this magazine.

If the average contractor will pay more attention to the time his men spend on certain tasks and will analyze the data obtained there will be fewer non-profitable jobs. This, of course, assumes that in making up his bids for future jobs the contractor does not cut his figures below his known costs. The curse of the construction industry has been the group of contractors who have "bid wild" and taken jobs consistently at a loss.

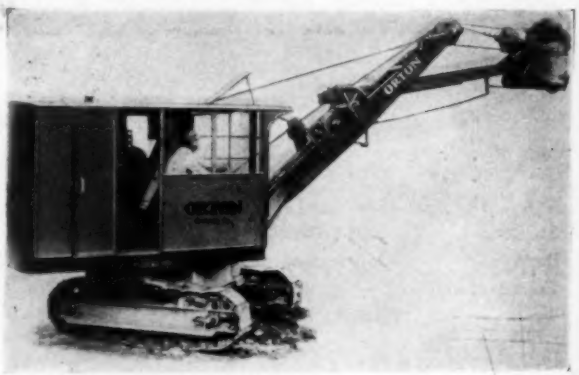
A 5/8-Yard Convertible Shovel

A FAST convertible ⅝-yard shovel has recently been brought out by the Orton Crane & Shovel Co., Chicago, Ill. Alloy steel is used for all the power shafts and gears and the extension of the cab is handled so that work can be seen from both sides of the operator's position. Strength and rigidity of the base are obtained by making it of rolled plates and shapes which are both riveted and electric welded. Flexible crawling treads of the spring type are used to absorb shocks and protect the operating mechanism from undue strains. The springs distribute the weight of the machine uniformly over the treads so that it is not concentrated when the machine travels over uneven ground, logs or other obstructions. This Model-A machine can also be furnished with road wheels or for mounting on a standard motor truck chassis.

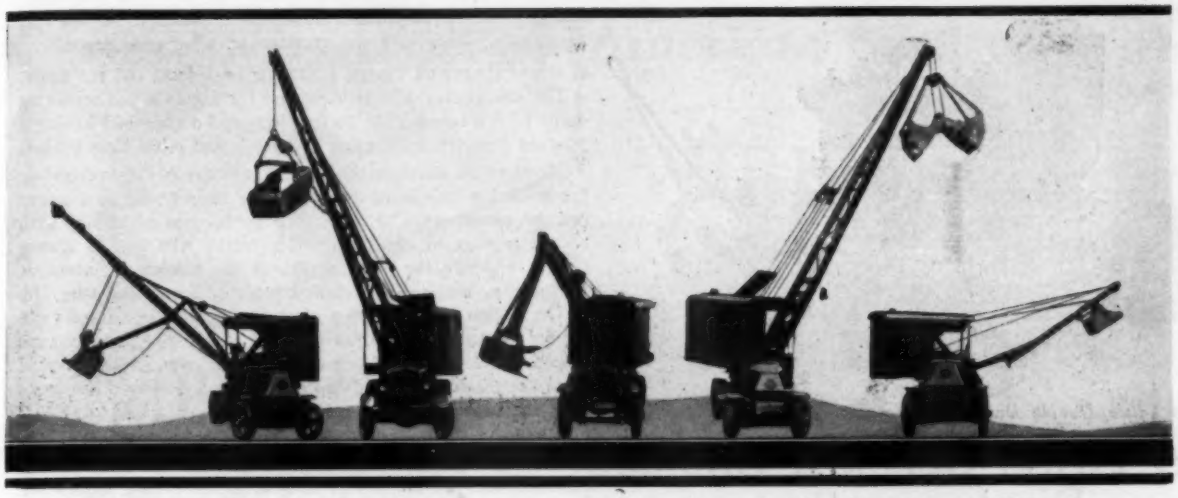
The unit can be furnished with shovel, crane, dragline, ditcher or skimmer attachment and can be changed from one to the other in the field in less than two hours, according to the manufacturers. The positive crowding action is secured by transmitting the full power of the engine directly to the digging edge of the dipper by a patented gear-driven crowding device. The shipper shaft is driven by a slip friction adjusted to release before the main clutch is slipped or the engine stalled. In operation the crowding clutch is thrown in completely and a constant thrust is maintained on the dipper. The slip friction absorbs shocks and jars and prevents killing the engine or transmitting undue strains to the power clutch. The entire crowding mechanism is integral with the boom, thus facilitating changes to other attachments.

The Model-A crane has a lifting capacity of six tons at a 12-foot radius and when equipped with a standard 30-foot boom handles a ½-yard bucket through its operating range. Booms 35 or 40 feet long can be secured for hook operation. The patented Orton T-head on the ditcher attachment is designed to give maximum pull-back when the dipper stick is nearly horizontal, and minimum pull when the scoop is in a digging position. The two drums mounted on the boom, one on the top leading to the hoist drum and the other leading to the scoop eliminate a sheath at the scoop and give a direct pull. The dragline has a 30-foot lattice-type boom and the fairleader slides so as to give the most direct lead possible to the drum, being carried on a bronze-bushed cast steel lead sheave with guard sheaves properly balanced so as to produce a minimum amount of wear on the cable. It handles a ½-yard bucket.

The skimmer is provided with a steel boom from the scoop and is suspended by means of bronze-bushed steel rollers. It has an effective length of travel of 11 feet and the scoop has a capacity of ½-yard with a width of 30 inches, although special widths may be secured as desired.



A New Model-A Orton ⅝-yard Convertible Shovel



The World's Only Builders of a complete line of Motor Truck-mounted Cranes, Shovels, Draglines, Skimmers and Backdiggers.

The UNIVERSAL CRANE CO., 1330 E. 28th St., LORAIN, OHIO

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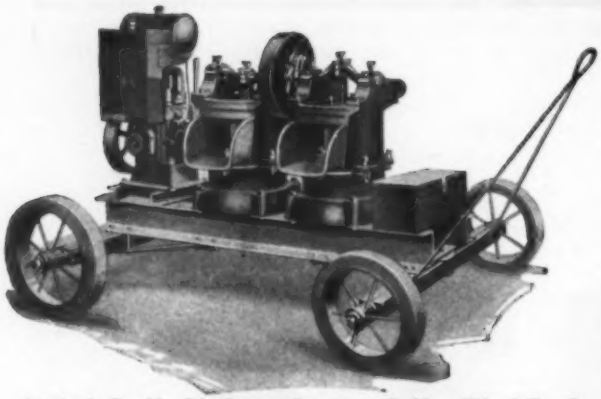


A 4-inch Double Diaphragm Pump on Rubber Wheel Truck

A Power-Operated Double Diaphragm Pump

A FOUR-INCH double diaphragm pump unit with a suction pulling from 20 to 25 feet and with a capacity of 12,000 gallons per hour has been developed by the O. E. Szekely Corp., Industrial Division, Holland, Mich. The pump is self-priming and is developed for unwatering, particularly where there is sand, gravel, small stones or mud.

The pump is a Goulds double diaphragm with 4-inch intake and 4-inch discharge, using a short stroke and a large diameter diaphragm to insure long life. An overhead crankshaft with built-in gearing is used to prevent misalignment caused by a separate jack shaft.

The diaphragms are of first quality rubber replaceable upon removing four brass nuts which hold the top cover down. The side section with suction valve on an incline offers little resistance to semi-liquids, insuring full capacity from the pump at all times.

The pump is powered with a Cushman engine of 4-horsepower with 4-inch bore and 4-inch stroke, geared directly to the pump, eliminating jack shafts and walking beams. This vertical engine is cooled by a radiator and fan driven by the engine. The entire unit is mounted on a rigid structural steel frame of channels and may be mounted on a truck with rubber tires for easy transportation.

A Versatile Power Shovel

A NEW power shovel has been announced recently by the Star Drilling Machine Co., 505 Washington Street, Akron, Ohio. This shovel has several unique features. The full swing and exclusive Star telescoping boon enables it to get in and out of tight places, always to work at full speed without any loss of time and to show an all-around dexterity.

With the grader and bank bucket, it has an unusually long reach, clearing trucks 19 feet out and dumping at 17 feet elevation in clear. It will make excavations 22 inches to 30 feet wide at one setting with the trencher or sub-digging scoop. It works always on the solid, moving back from the cut made.

The shovel may also be equipped for use as a full revolving crane with a boom 19 to 36 feet long and a clamshell having a ½-yard capacity for digging and a ¾-yard rehandling bucket.

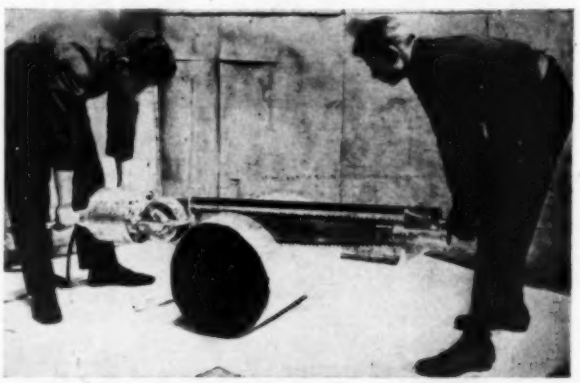
Mounted on full length crawlers, the Star is fully revolving, the revolving deck being secured to the main frame by a center pin and center gears by a set of powerful gibs contacting with the outer edge of the swing roller track. The load is always carried opposite the main weight of the machinery, never at right angles, a feature which makes for efficiency and long life.

The engine is set up on a steel frame, so that all parts are easily accessible for adjusting and oiling. The drums are placed just in front and below the engine and can be removed from the machine without the necessity of moving other parts than the bearings.

All levers and parts of the Star shovel are easily handled and serviced. The traction lock, swing lock, main clutch lever, crowding and hoisting levers and electrical starting button are conveniently located within easy reach of the operator's seat on the right hand forward end of the upper deck of the machine. The operator trips the bucket, starts the engine, locks his tread wheels and completely handles his machine without leaving his seat. This operating convenience saves considerable time. The Star's unique traction lock, by eliminating a ground man, cuts the payroll at the same time that it increases operating efficiency.

A Waukesha GU 60-horsepower motor is used. The power plant, which is located at the rear of the machine, exerts a torque of approximately 10,000 pounds on either line where it leaves the drum, allowance having been made for all friction losses. In the case of the crowd through the spool and gearing this is stepped up until the crowd on the scoop is approximately 33,000 pounds and the hoist line is reeved to give a three to one increase on a bale pull of 30,000 pounds.

Star Power Shovel in Use by the Uvalde Company in Bayonne, New Jersey



The New German Electric Saw for Logs and Heavy Timber

Saw for Heavy Work

AN electric saw which has been developed particularly for sawing tree trunks or similar large wooden blocks up to 40 inches in diameter, has been developed by Gebrueder Schmaltz, Maschinenfabrik, Louisenstrasse 7, Offenbach, a. M., Germany. This saw is driven by a 3-phase 4-horsepower motor with a totally enclosed chromium-nickel steel gear. A double convex chain guide, cutting chain and switch complete the equipment. The entire construction of the machine is extremely rugged. It may be used to advantage for lumber cutting in lumber yards, for cutting timber on construction work, etc. The machine is built for diameters of 20, 30 and 40 inches and was exhibited at the Leipzig, Germany, Fall Fair.

3

Save Time and Money!

COLUMBIA CALCIUM CHLORIDE

77 - 80%

TRADE MARK

To get the job completed and the road opened at the earliest possible date is the prime necessity in building concrete roads today.

"3-C" 77%-80% Flake Calcium Chloride is an effective and profitable aid in achieving this result. "3-C" cures concrete faster and gives it greater strength.

Instead of keeping the new road under straw or earth for 21 days it is ready for traffic in 7 days if the "3-C" method is used. Sprinkling is eliminated.

This means saving money as well as time.

"3-C" Calcium Chloride is of great value in cold weather construction. When used in conjunction with the usual precautionary measures "3-C" makes it safe to continue operations in much colder weather than is possible without the aid of calcium chloride.

We invite everyone interested in road building, or road maintenance, to write for our free booklets and complete information.

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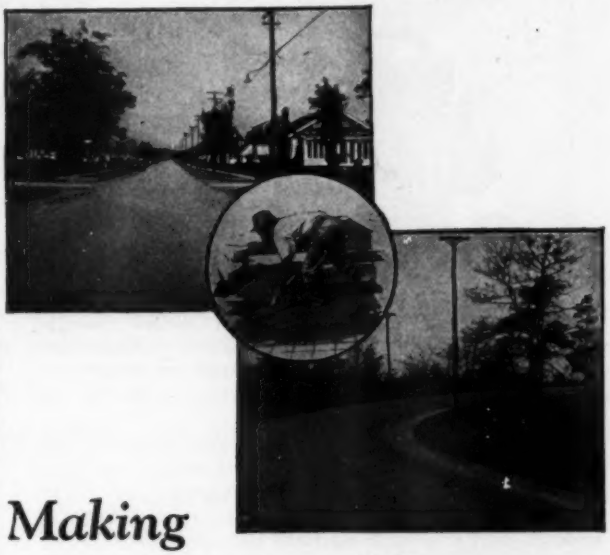
"The Steel Backbone for Concrete"



Making City Street and Country Highway Permanent

TO reinforce concrete roads with Wire Fabric makes them permanent and is a proven economy. This fact is conclusively brought out in the report of the Highway Research Board, National Research Council.

Made of cold drawn high tensile strength steel, Wire Fabric has proved itself the perfect slab reinforcement. It gives the most effective distribution of steel—the closely spaced wires insuring greatest binding strength, holding the slab together as a solid unit and preventing the development of cracks.

Wire Fabric means permanent reinforcement—longer concrete life—lower maintenance costs. It is furnished in sheets cut to definite size which are easily handled and placed.

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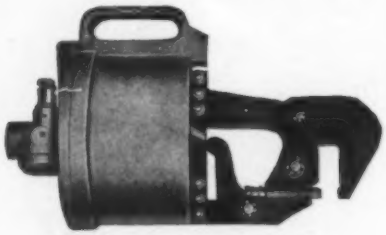
SALT LAKE CITY	Walker Bank Bldg.		

**United States Steel Products Company.*

A New Rivet-Squeezing Machine

A NEW portable pneumatic riveter that squeezes instead of hammers light rivets into place, has been perfected by the Chicago Pneumatic Tool Co., 6 East 44th Street, New York.

This machine that is known as the CP squeeze riveter, is made in two sizes, the smaller one weighing but 8 pounds and



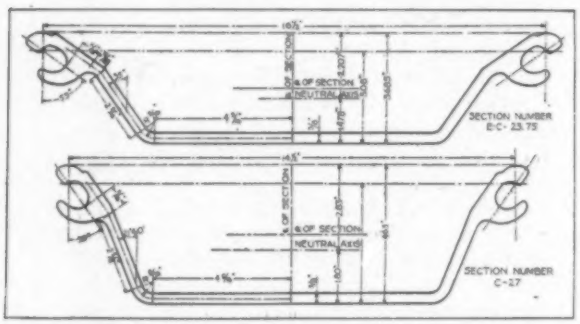
The New CP Squeeze Riveter

capable of driving steel rivets up to ⅛-inch diameter, duralumin rivets up to 5/32-inch diameter and aluminum rivets up to 3/16-inch diameter. The larger size weighs 16½ pounds and drives steel rivets up to 3/16-inch diameter and aluminum rivets up to ¼-inch diameter.

The yoke can easily and quickly be removed and a wide range of interchangeable yokes can be furnished for almost any size of gap and reach. This interchangeable yoke feature permits the use of the same machine for a great variety of work. A number of these machines are now in use.

A New Type of Steel Piling

A NEW type of steel piling, two sections of which have already been produced, is being brought out by the Jones & Laughlin Steel Corp., American Iron and Steel Works, Pittsburgh, Pa. Six sections in all are being



Two New Sections of Interlocking Steel Sheet Piling

planned for, all with improved double lock of greater strength. The section will have the following features; universal interlock, uniform thickness of metal, minimum weight for strength, and saving in weight as high as 20 per cent over some other sections.

The two sections, EC-23.75 and C-27, as well as all other sections, have a thickness of metal that is constant ⅜-inch. With improved double lock and greater strength, they are ideal for cofferdam construction, as in dock walls, piers, bulkheads, revetments, and seawall construction. The sections are integrally balanced with neutral axes close to the center line of the section. These balanced sections will drive plumb and make distance in the wall when driven. The channel section, for weight of material used, produces the highest section modulus possible. The extended channel sections are lighter in weight per square foot and of the required strength.

The sections have the same universal interlock, of 3-line contact, and of great tensional strength, and watertight qualities, with ample clearance for free driving. The universal interlock makes combinations of all designs of sections a possibility, with the advantage of a wide range of weights and properties per square foot. A combination of two sections produces the required type of wall, most economical in weight, and of the required beam strength for the purpose planned.

All sections are ideal for core wall construction, as they have a uniform thickness of metal, universal interlock, and can be combined for strength and economy. The deflection in each interlock can be 20 to 30 per cent each side of the center line. The sections can be straightened in the field, after use or withdrawal from work, with economy, and without difficulty. The interlocks are so designed that they tighten under stress or pressure.

The weight of the EC-23.75 steel piling section is 32.50 pounds, and the width of the section 16½ inches. The weight of the C-27 is 32.50 pounds, and the width 14½ inches. The section modulus interlocked is 12.62 inches, and 17.33 inches, respectively, and can be used with safety when sections can be welded after driving, or a percentage of this combined strength figured when interlocks are packed in hard driving at the bottom and bolted or welded at the top.

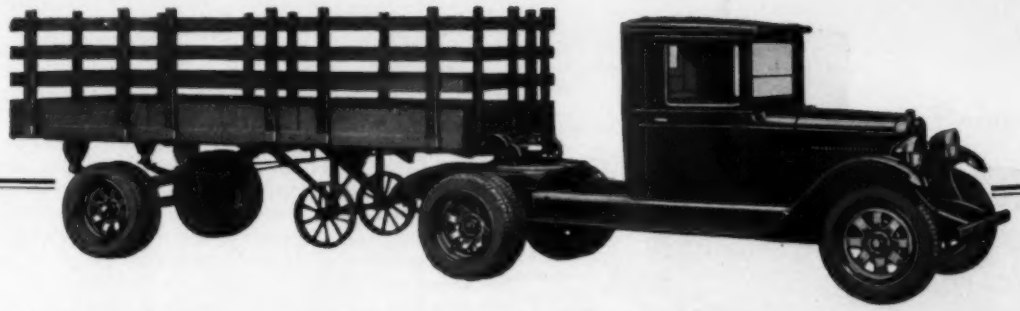
Because of the elasticity of design, all sections can be combined and interlocked. A section of high section modulus or of great resistance to bending, should be driven in contact with waling, to hold the bottom of the steel wall with the minimum amount of penetration. A more flexible section should be selected for intermediates, to act under water pressure to close the cofferdam, minimizing pumping.

The K-M Grader Attached to a Tractor

A Pull-Type Grader Handles Bulldozing

A NEW pull-type patrol grader for attachment to any standard tractor and known as the K-M patrol grader, has been developed by the Landreth Machinery Co., Joplin, Mo. The grader operates under the direct control of the tractor driver from his usual position on the tractor seat. The grader, as shown in the illustration, is simple in design, is detachable in ten minutes, and may be attached to the tractor without changing the position of the wheels of the tractor and without drilling any holes or changing any bolts of the tractor.

Compression springs give the blade a predetermined pressure. The blade is manually operated both longitudinally and laterally without a fixed center point. The blade may be reversed for bulldozing and when backfilling ditches. The complete machine may be turned around on practically any road without backing and because of the pull and the peculiar leverage employed, the machine is effective in cutting out pockets and corrugations. It is free from chatter and may be used effectively for spreading.



A FULLY AUTOMATIC SEMI-TRAILER FOR YOUR LIGHT TRUCKS

By using a W & K Automatic Semi-Trailer, you can convert any of your ton to ton and a half trucks into a unit that will haul a five-ton load.

The W & K job is fully automatic, has its own brakes, couples and uncouples easily; the driver doesn't have to leave his seat. It is equipped with Websteel Wheels, single or dual, as you want.

Write for illustrated circular, and tell us your make of truck.

Whitehead & Kales Co
Detroit Mich

Try them on your next job

HOOK the Bates Tying Tool in the tie loops—pull once—and you have a tight non-slipping tie.

Contractors have proved that Bates Ties and Tools speed up reinforced concrete work. No special skill is needed; even unskilled men can tie rods fast and well, with Bates Ties.

There are 5000 wire ties (one size) in a roll and all popular sizes carried in stock. Information regarding sizes for your needs gladly furnished upon receipt of rod specifications. Try them on your next job!

BATES VALVE BAG CORP., 35 E. Wacker Drive, Chicago

BATES WIRE BAR TIES

The New Domestic Direct-Drive Centrifugal Pump Unit

A New Engine-Powered Direct-Drive Pump Unit

AN engine powered pump unit, designed expressly to meet the requirements of the construction trade, has been announced by the Domestic Engine and Pump Co., Shippensburg, Pa. These gasoline engine units, mounted on trucks, are self contained centrifugal pumping plants, easily moved because of their compactness, and of large capacity.

A foot valve is furnished as part of the regular equipment and the discharge fitting of the pump has a hand hole plate that provides a large and accessible port for filling the suction line and pump with water. If an automatic primer is desired, these pumps may be equipped with the Domestic vacuum primer.

Between the engine and pump is a flexible coupling which has machined cast iron drivers with a "cord rubber" center connection.

The pumps are furnished with 4- or 6-inch suction and 4-inch discharge openings. The maximum suction lift is 18 feet and the total heads from 10 to 80 feet give discharges varying from 800 to 250 gallons per minute varying also with the size of engine. The pumps are equipped with 2-cylinder 5 to 8-horsepower, 4-cylinder 11, 15 and 20-horsepower engines.

A New Setting for Diamond Core Drill Bits

THERE is no real substitute for black diamonds as a material for setting core drill bits when the rate of progress and the cost per foot of hole drilled in any formation are the only factors to be considered. Under certain conditions, however, the possibilities of a substitute have been recognized and many experiments have been made in the search for a suitable material.

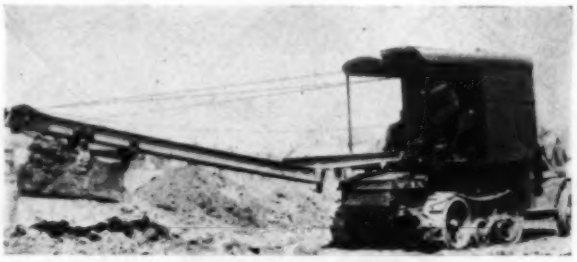
Sulamite, which is a trade name registered by the Sullivan Machinery Co., 162 South Michigan Avenue, Chicago, Ill., has proved to be one of the most acceptable substitutes for the black diamond thus far developed. Sulamite is a metallic alloy, having practically the same characteristics as carbon or black diamonds with the exception that it is not as hard. It is, however, considerably harder than emery, corundum and similar substitutes. In competition with other substitutes, this material has proved its superiority, according to the manufacturer, both in the laboratory and in drilling work in the field.

In igneous rock and in hard sedimentary or metamorphic formations, black diamonds are without competition and the same is true in sharp or abrasive rock. In soft sandstone, soft limestone, shale and other relatively soft sedimentary strata, Sulamite has been used effectively. In such cases the lower first cost of the investment for the substitute as compared with diamonds offset the slower progress and higher cost per foot drilled. Where these formations are cavey or pockety as is frequently the case, the possibility of sticking the tools and of injury to or loss of diamond bits makes the use of the Sulamite bit advisable from the standpoint of economy. The cost of the substitute per unit is very much less than that of black diamonds. Sulamite is furnished in cubes and also in octagonal pieces. These are suited for the different sizes of bits in ordinary use.

A New Skimmer Scoop for Motor Truck Mounted Equipment

A NEW skimmer scoop that has been built for use on motor truck mounted equipment, has been brought out by The Universal Crane Co., 1302 East 28th Street, Lorain, Ohio. This skimmer scoop is readily adaptable to any standard Universal crane, being interchangeable with the other Universal attachments, such as clamshell or dragline or the back digger attachment.

The skimmer boom is a built-up, riveted, all-steel box section with a double track along the bottom side, on which runs a carriage of four rollers supporting the skimmer bucket. The skimmer bucket is equipped with a special cutting edge and can be used with or without teeth, depending on the character of the material being graded. The cutting stroke

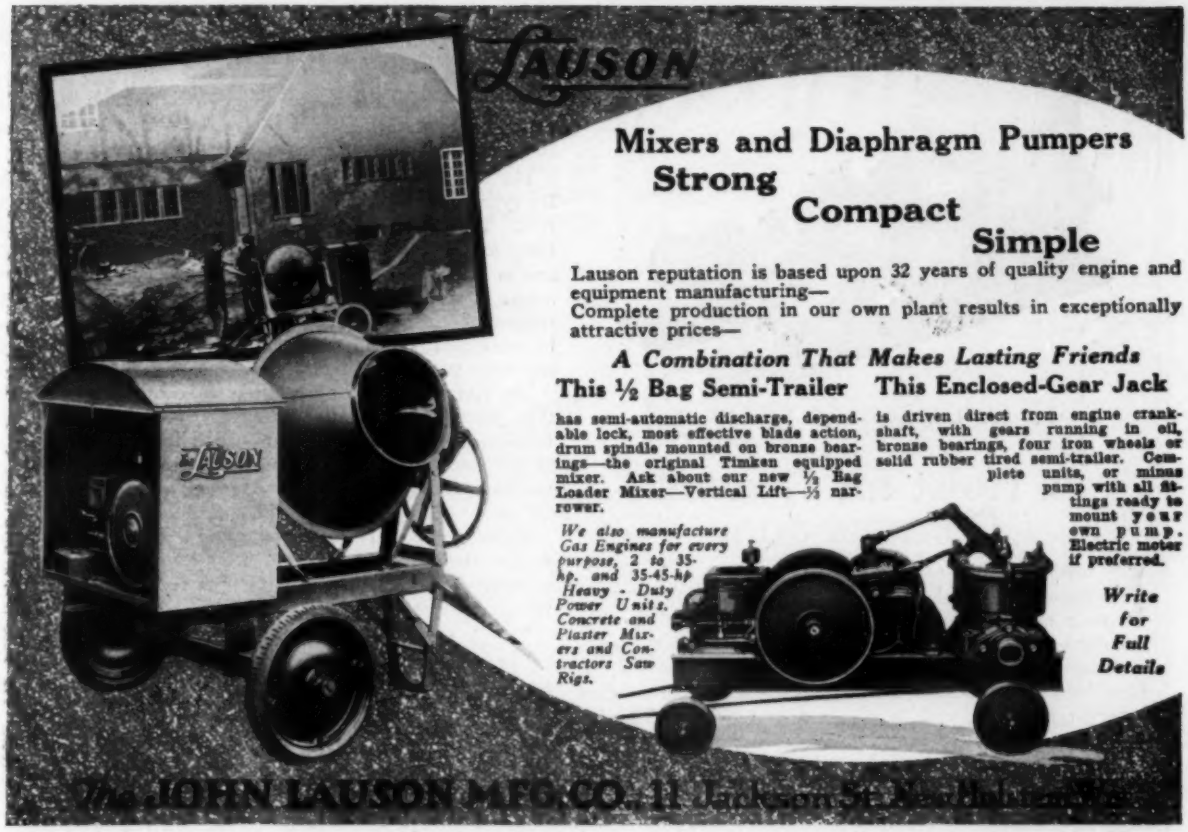


The New Skimmer Scoop for Universal Crane

of the buckets is approximately 12 feet and the maximum cutting radius is approximately 25 feet. The control of the boom permits making cuts from 6 inches to 2 feet deep with a very accurate control.

The bucket is of a bottom dump type, with a trip controlled by a lever just to the right of the operator. The bucket is returned to a digging position by gravity. A special spring mounted stop is provided at the back end of the runway to take up this impact, thus saving the boom and bucket from undue shock.

The operating speeds are exceptionally fast, the bucket speed being 70 feet per minute on two part line, and the boom hoist being controlled by the shell drum with a speed of 150 feet per minute. To aid in the speedy and constant boom derricking required for skimmer work a special oiling device is provided for the boom feet sockets. The operator controls all operations from his seat located at the front of the rotating platform, with an unobstructed view of his work at all times. There are only two hand levers and two foot pedals to control all the major operations.



LAUSON

Mixers and Diaphragm Pumpers

Strong

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Simple

Lauson reputation is based upon 32 years of quality engine and equipment manufacturing—
Complete production in our own plant results in exceptionally attractive prices—

A Combination That Makes Lasting Friends

This ½ Bag Semi-Trailer has semi-automatic discharge, dependable lock, most effective blade action, drum spindle mounted on bronze bearings—the original Timken equipped mixer. Ask about our new ½ Bag Loader Mixer—Vertical Lift—½ narrower.

This Enclosed-Gear Jack is driven direct from engine crankshaft, with gears running in oil, bronze bearings, four iron wheels or solid rubber tired semi-trailer. Complete units, or minus pump with all fittings ready to mount your own pump. Electric meter if preferred.

We also manufacture Gas Engines for every purpose, 2 to 35-hp. and 35-45-hp Heavy-Duty Power Units. Concrete and Plaster Mixers and Contractors Saw Rigs.

Write for Full Details

The JOHN LAUSON MFG. CO. 11 Jackson St. New Holstein, Wis.

EUCLID CRAWLER WAGONS

The fast and economical performance of the first six wagons put on this job sold twenty more

Starting in the middle of last winter and working continuously ever since Euclid Crawler Wagons have moved the bulk of the earth on the largest real estate development in Cleveland. Over a million and a half yards of excavation are involved.

Several contractors have been handling this job. Some use single Euclid Wagons behind their Caterpillar thirties; others pull two or three behind their sixties, as the length of haul and ground conditions permit.

The Single Wagon units frequently demonstrate their usefulness in quickly backing and placing loads in almost inaccessible places.

The Wagons in train track closely even in turning short under shovels, and work at high efficiency on the long hauls, which are sometimes as great as 1500 feet.

The wagon dumpers like the easily operated rear controls where they feel safe as they swing up on the rear corner step to dump the loads or to raise the doors.

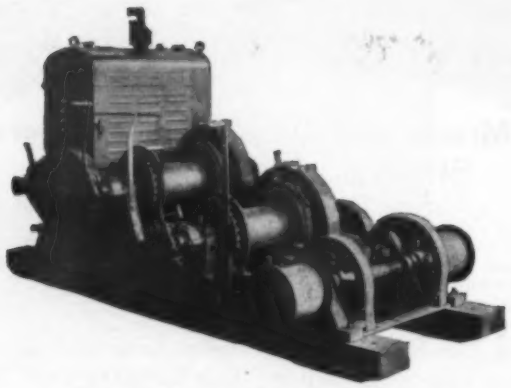
The Euclid crawler wagon is without question the strongest and most easily handled wagon of its type in the field.

EUCLID CRAWLER WAGONS MOVE MORE EARTH AT LESS COST.

Write for full specifications

THE EUCLID CRANE & HOIST CO.

EUCLID, OHIO



The New Lidgerwood Super-Utility Hoist

A Hoist for General Construction

IN order to increase the range of usefulness of its multi-purpose gasoline hoist a new Super-Utility-40 gasoline hoist rated at 4,000 pounds at 250 feet per minute has recently been placed on the market by the Lidgerwood Manufacturing Co., Elizabeth, N. J. This hoist is built as a single drum hoist with a second drum unit available for installation either at the factory or in the field as required. The 40-horsepower 4½- x 6¼-inch 4-cylinder gasoline motor supplies ample power for derrick work, making the application of a swinging gear unit practical. The swinging gear may also be added or removed at any time.

The drum, 12 inches in diameter with a 20-inch face and 24-inch diameter flanges, holds 800 feet of ⅝-inch rope, the rope leading over the drum on both drums which are fitted with powerful lined band brakes over the friction at the gear end. Cork inserts pressed on the maple friction blocks in a staggered pattern increase the holding power of the blocks with a corresponding decrease in operating effort. The drum shafts are extended and key mounted winch heads 7 inches in diameter and with a 10½-inch face, operate independent of the drum. A disc clutch mounted between the motor and the power take-off shaft permits the starting of the motor under no load.

For straight runs of fairly uniform loads, the specialized hoists, such as the high-speed elevator hoists and the heavy duty steel erector's hoists, are highly efficient. A great diversity of loads is typical of many construction jobs, and the general purpose hoist has been developed as better suited for this class of work. Using three or five parts of rope, the Super-Utility-40 will handle heavy pieces at a fair speed, yet it is economical when used on light hoisting.

An Electric Motor-Driven Portable Compressor

A PORTABLE air compressor driven by an electric motor and mounted on a trailer with solid rubber tires, has been developed by the Chicago Pneumatic Tool Co., 6 East 44th Street, New York. The outstanding feature of this equipment is the direct connection of the compressor motor through a quickly detachable flexible coupling without the use of any reduction gears. It is equipped with a radiator, fan and pump, instead of the customary water tank. The air cylinders are cast separately from the crank case. They are first bored and then ground to present a true glasslike surface. The compressor bearings are particularly accessible.

The compressor is of the vertical single-acting duplex type. Its cylinders are cast en bloc and are completely water-jacketed. The cylinder head is removable, increasing the accessibility of the machine. The crank case is completely enclosed and is fitted with large oil-tight removable doors which give access to the interior for adjustment and cleaning. Through these doors the main bearings and connecting rod bearings may be conveniently and completely adjusted without disturbing any other parts of the compressor.

The lubricating system is entirely automatic. A small gear-type pump driven by the crankshaft applies oil to the main bearings and to the oil splash troughs into which oil throwers on the connecting rods dip. The oil control ring on the piston and its especially designed groove prevent oil from working past the piston and contaminating the air.

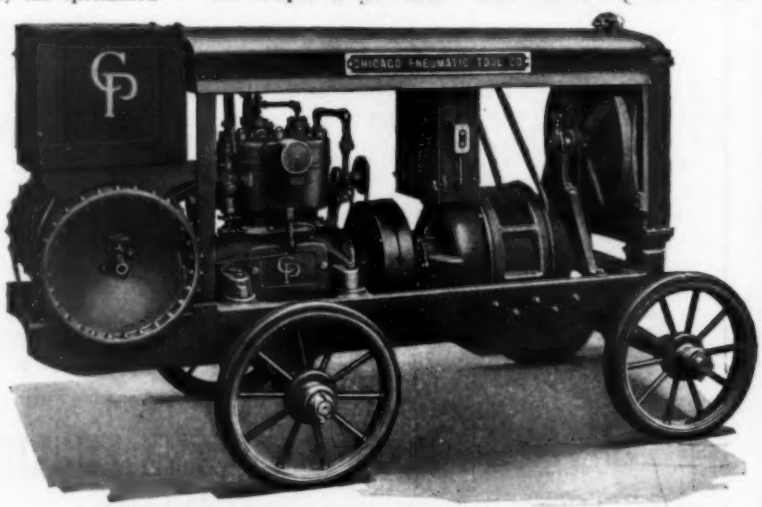
Water circulated by the engine pump through a tubular radiator of large capacity cooled by a fan serves to cool the compressor. The radiator core is built in several sections and is protected by steel bars.

The air supply is regulated by means of a Simplate unloader acting in connection with the unloading inlet valve. When the pressure in the receiver reaches a predetermined maximum the unloader allows air from the receiver to pass to the unloading inlet valves, holding them open and causing the compressor to operate unloaded. When the pressure in the receiver has dropped sufficiently, the unloader operates, venting the air from the valves and causing compression to be resumed.

The frame or deck is built of structural steel sections securely fastened together to form a rigid strong unit. The deck of the 100- and 160-cubic-foot compressors is furnished as a one-piece steel casting. The air receiver is securely held in place on the deck by two saddle brackets upon which is mounted a large tool box. The saddles also support the gasoline tank.

An expansion joint is used in the discharge line between the compressor and the receiver. The receiver is an all-riveted tank and is equipped with a service globe valve at each end, drain valve, fusible plug, safety pump valve, pressure gauge and necessary pipe and fittings.

The compressor is mounted on steel or rubber tired wheels.



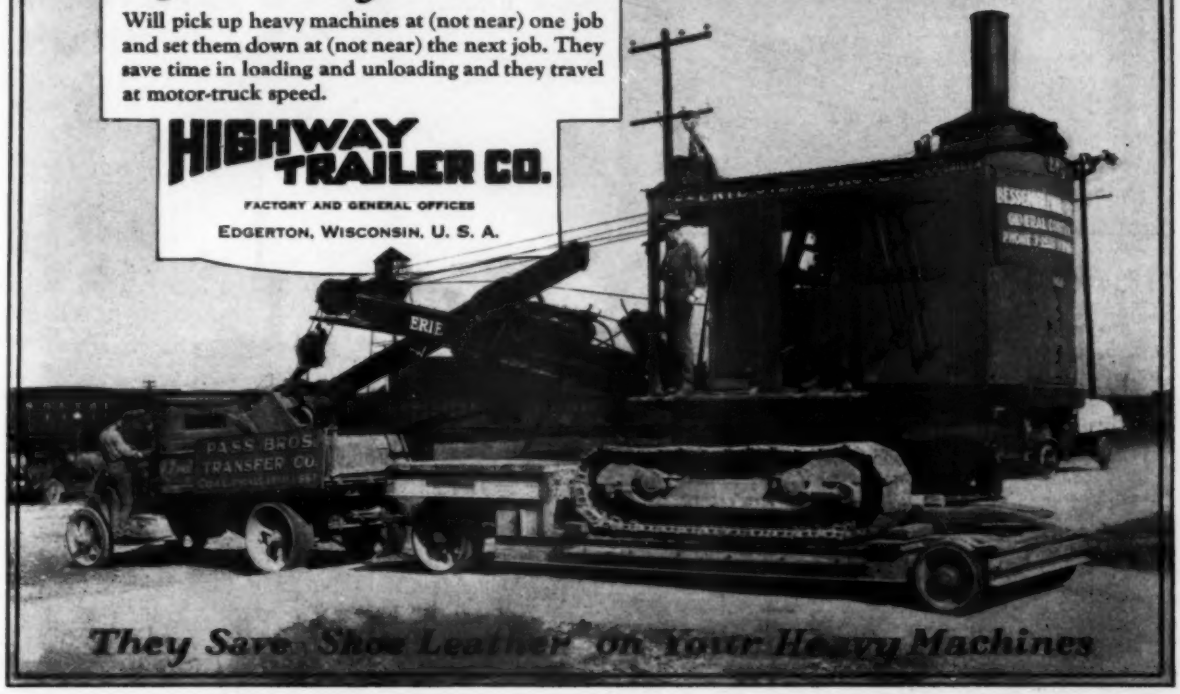
The New Chicago-Pneumatic Electric Motor-Driven Compressor Mounted on Rubber-Tired Wheels

Highway Machinery Trailers

Will pick up heavy machines at (not near) one job and set them down at (not near) the next job. They save time in loading and unloading and they travel at motor-truck speed.

HIGHWAY TRAILER CO.

FACTORY AND GENERAL OFFICES
EDGERTON, WISCONSIN, U. S. A.



They Save Shoe Leather on Your Heavy Machines

The Safest Spot on the Street

is made safe by

THE TOLEDO TORCH

It guards by day as well as by night, at a cost much less than for any other safety signal.

TOLEDO TORCHES will burn in a gale of wind, or a downpour of rain, or— a combination of both. They will burn twice as long as ever necessary without refilling. Recent developments make this the most dependable light on the market.

The Toledo Pressed Steel Co., Toledo, O.

New Four-Wheel-Drive Austin Motor Grader

A New Dual-Drive Motor Grader

FOUR-WHEEL drive is the feature of the new motor grader announced by the Austin-Western Machinery Co., 400 N. Michigan Ave., Chicago, Ill. It is claimed that this drive furnishes all of the valuable features of a crawler tread without the disadvantages of high powered construction, excess friction or greatly reduced speed. The entire weight of the McCormick-Deering 10-20 tractor, which furnishes the motive power for this grader, is carried on the four drive wheels rather than on the frame of the grader. The extra weight on these drive wheels together with the increased ground contact gives greater traction. With the Austin dual drive the motor will kill itself in an effort to spin the wheels before they will slip.

While the four drive wheels are regularly fitted with 6-inch tires, those who wish to obtain maximum service and especially the ability to get on the job early in the spring or soon after a rain, can obtain 10-inch tires which provide twice as much bearing surface as is provided on ordinary graders. The four areas of driving contact make it possible for the dual drive motor to get over soft ground and over slippery or wet holes that would be quite impossible for the old two-wheeled type.

The front end of the tractor is carried by a spring support on its own drive wheels and axle instead of by the frame of the grader which is pivotally connected by heavy rocker beams with the rear axle. This gives the tractor flexibility and freedom to move up and down inside the grader frame as uneven road surfaces makes such movement necessary, using the rear axle of the tractor as a pivotal point.

With the exception of the features mentioned above and also a new type of blade lifting mechanism all of the Austin features remain unchanged. Among these are the ball and socket blade raising rod connection, the heavy cast steel circle with the positive locking device and either leaning front wheels or an automotive type of steering of special Austin design.

New Carbide Light Uses Lump or Cake Fuel

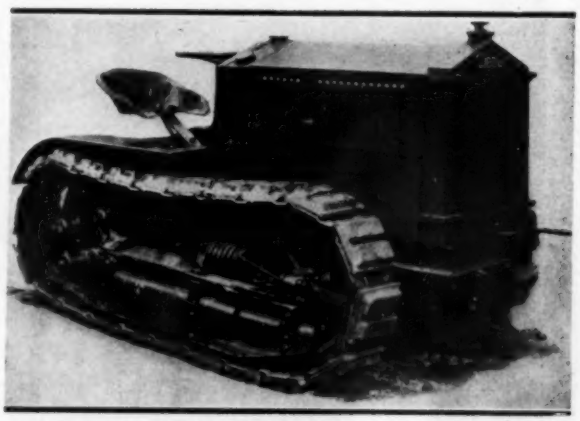
A NEW kind of carbide light which will operate with either lump carbide or carbic cakes has been announced by the Alexander Milburn Co., 1416 West Baltimore St., Baltimore, Md. This addition to the Milburn line is to provide a light or welding generator with extra gas storage space and which does not restrict the user to any particular kind of carbide.

The center of the carbide container is a cylinder which holds the carbic cake and which is equipped with the proper facilities for taking care of the sludge. The outside of this container is filled with conical pockets for the reception of ordinary carbide. The generator is designed so that it cannot be overcharged and it can be recharged without changing the water. It has an automatic burner cleaner which cleans the

The New Milburn Carbide Light, Showing Fuel Container Removed

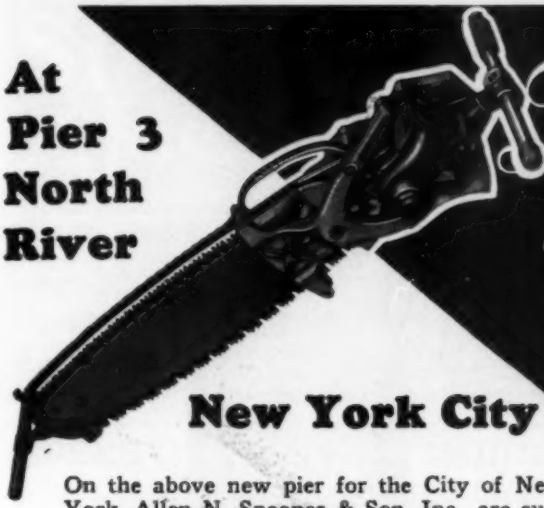
burner while the light is burning and it is stated that the operating cost is only 3 1/3 cents per hour for 8,000 candle power using ordinary carbide.

The new dual fuel principle is incorporated in single lights of 8,000 and 12,000 candle power and in the duplex light of 16,000 candlepower. All standard Milburn lights operate on either carbic cakes or ordinary carbide, but the new lights or generators described above offer certain extra conveniences to those who have occasion to change from one fuel to another.



A Cletrac "20" Equipped with Double Face Rubber Treads, Which Enables the Tractor to Operate Under Conditions Where the Standard Grouters Would Not Be Practical, as Traveling Over Hard Wood or Cement Floors, or Traveling Over the Finished Surface in Scraping and Maintaining the Shoulders in Road Maintenance Work

At Pier 3 North River



The "WOLF" Portable Timber Sawing Machine

New York City

On the above new pier for the City of New York, Allen N. Spooner & Son, Inc., are successfully using our Air Driven "WOLF" Saw in cutting 12 in. piling and heavy timbers.

Dock and pier work is but one of many operations on which the Wolf Saw will show substantial savings in labor and time.

"Over 200 machines in successful operation"

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ACCEPT NO SUBSTITUTE

Yes—all Sterling wheels are equipped with "self-lubricating" axle bearings.

Sterling

"10-spoke" wheel with a smooth tread gives greater strength, rigidity and service.

No part of a barrow receives as hard abuse as does the wheel. Bumped—jammed—sharp twists and turns with a full load. To withstand this severe usage the Sterling has "10 spokes," instead of the usual 8. The spokes are riveted and shouldered to the tire and cast to the hub. The brackets are malleable iron. Compare this construction and you'll quickly see why more contracters. use Sterling than any other. Try them on your next job.

Leading Hardware and Equipment dealers have them—or they can get them quickly from our complete stock warehouses at Chicago—New York—Philadelphia—Pittsburgh—Cleveland—Detroit—St. Louis.

STERLING WHEELBARROW COMPANY

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

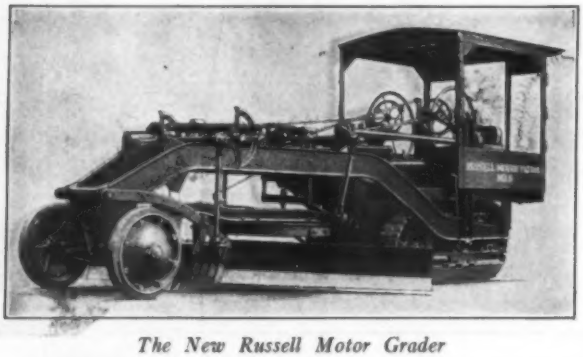
Milwaukee Wisconsin

A New Motor Patrol Grader

A MOTOR patrol grader built expressly for the Caterpillar Twenty tractor, has been announced by the Russell Grader Mfg. Co., Minneapolis, Minn., and is called the Russel Motor Patrol No. 6. The 58-inch diameter circle on this machine is reinforced with an extra angle iron which gives a better support to the blade. The circle is provided with a clamp support consisting of a screw clamp contact to the circle. There is a plate on the end of the screw which comes in contact with the circle, preventing the circle from becoming defaced.

The blade side shift is a rack and pinion type operated by a worm and gear, enclosed in a metal housing. The blade lift is of the worm and gear type enclosed in dust proof cases. The gear can be shifted to five different positions for wear.

Ball and socket connections are used in the lifting links, and the compensating spring blade lift consists of a tension spring applied over an equalizer cam so that the spring tension is uniform at any elevation of the blade. The drawbars are



The New Russell Motor Grader

hooked up to a universal connection which allows free motion without play. A snow plow attachment can be furnished making this grader an all-season unit.

The weight of the grader complete with scarifier and tractor is 15,850 pounds. It has a 210-inch wheel-base, a 52-inch tread in front and a 42-inch tread in the rear.

A Small Portable Flasher

AN electric portable flasher designed primarily for warning traffic where kerosene lanterns have been extensively used, has been developed by the National Carbon Co., Inc., 30 East 42nd St., New York. This new Eveready portable flasher has many other possible uses. Although the initial cost of the beacon is considerably more than that of an oil lantern, its maintenance cost is said to be so much less that in the long run, it provides a very economical warning signal.

The manufacturers call attention to the fact that oil lanterns are not dependable, thus more than the actual number needed as warning signals are usually used. They require a great deal of attention for trimming and filling which, at the present day labor wage scale, makes their maintenance expensive. It is estimated that this cost is approximately $50 per year per lantern where quantities of lanterns are used almost every night and where each lantern must have daily attention for filling and cleaning.

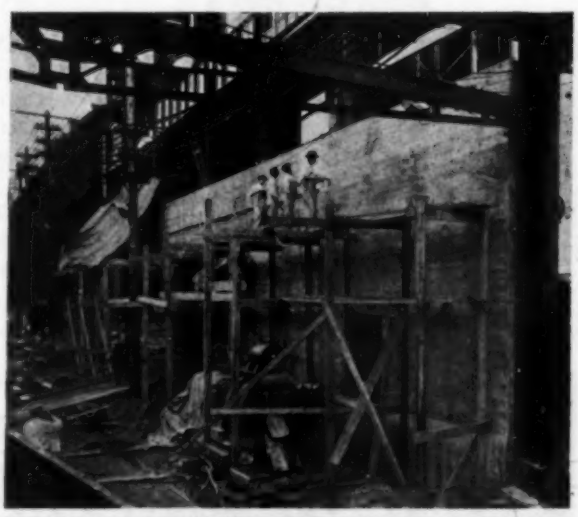
The Eveready portable flasher is served by Eveready Columbia dry cells, one set of which lasts approximately two months on the basis of continuous burning at a cost of about $10 per year. Such long and economical service is possible because the flasher subjects the dry cells to a light and intermittent drain under which the battery's capacity is best utilized.

In addition to this advantage in maintenance cost the portable flasher has the distinct advantage of its flashing feature

The New Eveready Electric Flasher for Use on Contsruction Work

which cannot be obtained with oil lanterns and which traffic and railway authorities agree is a much better warning signal than a steady burning light.

The Eveready flasher is 16 inches high, 7 inches in diameter at the base and weighs 16½ pounds including the batteries. It requires four standard Eveready Columbia 6-inch dry cells connected in series to deliver six volts. An extra 6-volt Eveready Mazda lamp No. 1135 is carried inside the battery housing. The battery compartment is constructed of seamless steel finished in red. The top of the flasher is cadmium plated for weather protection and the flasher is equipped with a heavy fresnel type red glass lens. There is a padlock for the battery compartment with an extra long hasp so that the device can be chained. The flasher is of rugged construction throughout and is entirely waterproof.



Tousley Light, Fast Turbine Air Tools Used in Surfacing the Concrete on the Allegheny County Steam Heating Company's New Plant in Pittsburgh, Pa.

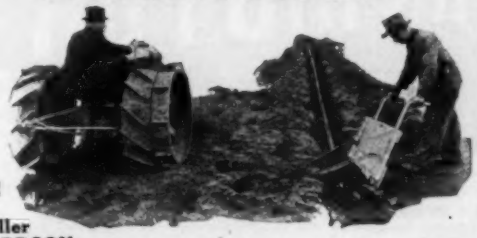
Simplex Jacks

for Industries · Utilities · Railways
Oil Wells · Mines · Engineering Contractors
Simplex Lever Jacks · Pipe Pushers · Trench Braces
Simplex Screw Jacks - with the Visible Screw -
Distinctive in Man Power, Safety & Simplicity

Templeton, Kenly & Co., Chicago, U.S.A.
The World's Largest Manufacturers of Jacks
Baldwin Locomotive Works, Foreign Representative

Simplex Screw Jack with the Visible Screw

CUT BACKFILLING TIME! DOUBLE PROFIT!

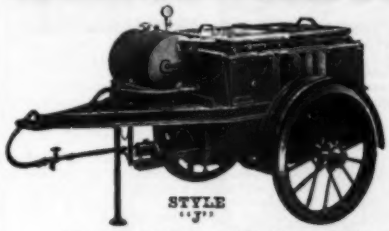


MIAMI Power Backfiller for FORDSON

Complete unit only $90—Easily paid for in a few days working time. Easy terms—write us.

THE MIAMI TRAILER-SCRAPER CO. 610 S. Clay St. Troy, Ohio

SPEED UP WORK BY USING



a Connery Style J oil-burning kettle. Here's a kettle that answers all requirements: —low fuel cost, quick heating, roller-bearing wheels and springs, absolute temperature control and solid rubber tires if desired.

We manufacture a full line of Tar and Asphalt Kettles, Oil Burning Kettles, Oil Burners, Torches, Pouring Pots, Hand Spraying Attachments, etc. Send for "Blue Book" describing our equipment.

Connery & Company, Inc.
4000 N. Second Street, Philadelphia, Pa.

SAUERMAN

SLACKLINE CABLEWAYS

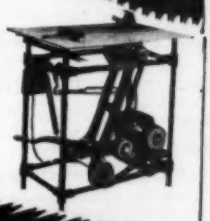
dig, convey, elevate and dump in one continuous operation

Because of their long reach and ability to work under water, Sauerman Slackline Cableways are especially suited to digging material from deep pits or rivers. They will operate at a radius of 500 to 1000 feet or more and dig and convey material to an elevated hopper at the rate of 30 to 50 bucket-loads an hour. Built in sizes from ¼ to 3½ cu. yd. Write for free book, "Excavating for Profit."

SAUERMAN BROS., Inc., 464 S. Clinton St., Chicago

AMERICAN SAW MILL MACHINERY CO.

CONTRACTORS' TREADLE SAW



PORTABILITY, lightness, strength, power, adaptability, and low price combine to make this Contractors' Treadle Saw one of the most effectual and economical woodworking machines on the market. *Descriptive circular on request.*

No. X-23

MAKERS OF WOODWORKING AND SAW MILL MACHINERY

171 Main Street Hackettstown, N. J.

WONDER TILTING MIXERS

Marsh-Capron Drum Type Mixers

CMC Hoists

Construction Machinery Co.
Waterloo, Iowa
Plants at Waterloo and Chicago Heights, Ill.

More Light *for* Less Money

Do you investigate the operating costs of your emergency lighting? Some lights cost 6c to 11c an hour for 8000 candlepower. The Milburn furnishes 8000 candlepower for only 3½c an hour.

Contractors who closely investigate operating costs report important savings through the use of the Milburn Light.

Patented features, exclusive with the Milburn Light, are responsible for these savings.

Write for information as to the EIGHT POINTS which will help you save money with Milburns.

Stocked in warehouses in all sections.

Ask for booklet No. 223-11 on "Lights" and 323-11 on "Welding and Cutting Apparatus."

THE ALEXANDER MILBURN COMPANY
1416-1428 W. Baltimore St., Baltimore, Md.

Hayward Buckets

—HAYCO—

Let Hayward Engineers recommend a bucket to fit the job. The Hayward line includes Clam Shell, Orange Peel, Drag Line and Electric Motor Buckets; Dredging, Excavating and Coal Handling Machinery; Automatic Take-up Reels; Counterweight Drums.

THE HAYWARD COMPANY
32-36 Dey Street New York, N. Y.

AN AID FOR CONTRACTORS

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

GAS ENGINES FOR EVERY PURPOSE

Engines designed to suit every purpose, made in various styles and types and ranging from 2-35 horsepower and 35-45 horsepower as well as heavy duty units, are manufactured by the John Lauson Manufacturing Co., 11 Jackson Street, New Holstein, Wis., who will be glad to send full details to those interested.

PILE DRIVERS FOR DIFFICULT JOBS

Bulletin 37 of the McKiernan-Terry Drill Co., 19 Park Row, New York contains a complete description of steam pile hammers type 9-B-2 as well as considerable valuable data on pile driving, including submarine work, pile pulling and demolition. A copy of this book will be sent to any contractor on request.

POWER-DRAWN SCRAPERS AND BULLDOZERS

Miami scrapers, operated by Miami power winches, which automatically load, transport and dump, controlled by one man, and Miami bulldozers for trench filling and earth levelling which also are subject to instant control through the Miami power winch, are manufactured by the Miami Trailer-Scraper Co., 610 S. Clay Street, Troy, Ohio, who will be glad to send complete details and prices on request.

CHEAP LIGHT FOR NIGHT WORK

Booklet No. 223-10 contains a complete description of the Milburn lights, including their eight outstanding features and will be sent on request to those interested by the Alexander Milburn Co., 1416-1428 W. Baltimore Street, Baltimore, Md.

JACKS FOR EVERY PURPOSE

Catalogs describing the various types of Simplex jacks, including the lever, screw and ball bearing types, the pipe forcing jacks, pole pulling and cable reel jacks and trench braces, will be sent on request by Templeton, Kenly & Co., Ltd., 1020 South Central Avenue, Chicago, Ill.

SHOVELS WITH THREE-LEVER CONTROL

Lorain shovels with the three-lever control and automatic crowd brake, which free the operator from fatigue and increase the operating efficiency of the shovel are described in detail in information which may be secured from the Thew Shovel Co., Lorain, Ohio.

WHEELBARROWS AND CARTS

Bull Frog wheelbarrows, carts and scrapers for every type of contracting and industrial use are described in a catalog which the Toledo Wheelbarrow Co., Toledo, Ohio, will be pleased to send to those interested.

TRACKSONS FOR ROAD USE

The Trackson McCormick-Deering master crawler-tractor, assuring ample power and sure-footed traction under all kinds of weather conditions, including not only usual snow falls but deep blizzard drifts, is described in Folder DH, which will be sent on request to those interested by the Trackson Co., 519 Clinton Street, Milwaukee, Wis.

MIDGET HAMMER FOR PAVEMENT BREAKING

The Union No. 9 Midget hammer, designed to come within the weight range of the pavement breaker and rock drill type of hammer and yet consuming less air, weighing 97 pounds, delivering over 250 blows per minute and striking a 275-pound blow, is described in catalog No. 124 on Pile Driving Machinery and Foundation Equipment of the Union Iron Works, West Shore Siding, Hoboken, N. J.

CENTRIFUGAL PIPE INSURES AGAINST LEAKAGE

Literature covering the uses and latest specifications of the DeLavaud centrifugal pipe, the pipe insuring pressure-proof tightness and great tensile strength, will be sent to those interested by the United States Cast Iron Pipe & Foundry Co., Burlington, N. J.

CHLORINATORS MAKE WATER SAFE

Wallace & Tiernan Co., Inc., Newark, N. J., will be pleased to send complete information to those interested in regard to their solution feed chlorinators for the sterilization of water at construction camps. These machines are long lived, flexible in operation, easy to clean, dependable and accurate.

SHEET STEEL PILING

Complete information in regard to sheet steel piling may be secured from Wemlinger, Inc., 149 Broadway, New York, who will be glad to forward such information to those interested.

MODERN AND FIRESAFE ROOFS

A new type of roof which is guaranteed for 20 years, is economical, modern and firesafe is described in Bulletin No. 1049 of the Blaw-Knox Co., 667 Farmers Bank Bldg., Pittsburgh, Pa., which they will be glad to send on request to those interested.

HEAVY DUTY GOOSENECK TRAILERS

Catalog No. 28 of Rogers Brothers Corp., Albion, Pa., completely describes and illustrates Rogers heavy-duty gooseneck trailers for transporting heavy machinery from job to job.

OLD PAVEMENTS MADE NEW

This is the title of an interesting 32-page, well-illustrated booklet issued by the Asphalt Association, 441 Lexington Ave., New York, describing the resurfacing of old roads with asphalt.

MOTOR-DRIVEN PORTABLE COMPRESSOR

Bulletin 787 of the Chicago Pneumatic Tool Co., 6 East 44th Street, New York, completely describes Chicago Pneumatic electric motor driven portable compressors which have many outstanding features of design.

AN AUTOMATIC SEMI-TRAILER

Double capacity, increased operating efficiency and decreased haulage costs are but a few of the many desirable features of the automatic semi-trailers of the Whitehead & Kales Co., Detroit, Mich., that are built to accommodate all the standard makes of light trucks and others in the 1 to 2½-ton field, and are described in an illustrated circular of the company.

INEQUALITIES OF TRACK MINIMIZED

A cross-equalizer that minimizes the inequalities of track, lessening the danger of derailment and that appeals to contractors who use industrial track on road work and in quarries and pits, is one of the many desirable features that is described and illustrated in Bulletin 2824 of the Geo. D. Whitcomb Co., Rochelle, Ill., that is available on request.

POWER OPERATED CENTRIFUGAL AND DIAPHRAGM PUMPS

Bulletins C and D which may be secured from Lorimer Dunlevy, General Sales Manager, the O. E. Szekeley Corp., Industrial Division, 12 West Fourth St., Holland, Mich., describe portable power operated centrifugal pumps in capacities from 80 to 2,400 gallons per minute and portable diaphragm pumps in capacities from 3,500 to 12,000 gallons per hour.

KEROSENE TORCHES AND TAR KETTLES

Contractors interested in Chausse-White kerosene torches, oil burning tar kettles, concrete mixer heaters for use on any type of mixer and the Chausse-White portable asphalt plant which is a complete, mechanically-operated unit for repairing street pavements, should secure a copy of Catalog A from the White Manufacturing Co., Elkhart, Ind.

A PULL TYPE PATROL GRADER

Complete information and prices regarding the new K-M pull-type patrol grader for attachment to any standard tractor and which operates under the direct control of the tractor driver from his usual position on the tractor seat may be secured from the Landreth Machinery Co., Joplin, Mo.

ROCK CRUSHING EQUIPMENT

Catalog KCE of the Good Roads Machinery Co., Kennett Square, Pa., describes this company's line of Champion crushers, Climax crushers, roller driven screens, gear driven screens, bucket elevators, belt conveyors and chutes and gates for bins, and illustrates many plants which are using this company's rock crushing equipment.

NEW OVERLOAD RELEASE SPROCKET

Complete descriptions and prices on the new automatic overload release sprocket for large and small bucket loaders and coal loaders which completely protects the machine against all strains on the bucket line, may be secured without obligation from the Barber-Greene Co., Aurora, Ill.

SAWING MACHINES FOR UNDERWATER SERVICE

Reed-Prentice Corp., Worcester, Mass., will be glad to send without obligation complete information in regard to its Wolf air-driven portable timber sawing machine which is particularly qualified for speed and accuracy in underwater service.

USED EQUIPMENT AVAILABLE

All kinds of used contracting and construction equipment in first class shape and ready for work may be purchased or rented from J. T. Rothwell, 10 Church Street, Beckley, W. Va., who will be glad to send full information on request.

WHEELBARROW OF EXTRA-STRONG CONSTRUCTION

Complete information in regard to the Sterling wheelbarrow which is scientifically formed to give the greatest rigidity, has special riveted construction, an extra leg shoe and is made in a variety of styles and sizes to meet every requirement, will be sent to those interested by the Sterling Wheelbarrow Co., Milwaukee, Wis.

A PORTABLE FLASHER

Contractors interested in a new portable electric flasher which operates entirely on dry batteries for use in construction work where kerosene lanterns have formerly been used, should secure the literature of the National Carbon Co., 30 East 42nd St., New York.

A NEW MOTOR PATROL GRADER

The Russell Grader Mfg. Co., Minneapolis, Minn., will be pleased to send information regarding the new motor patrol grader which has been recently announced for use with the Caterpillar Twenty tractor.

A NEW TYPE OF STEEL PILING

A new type of steel piling two sections, EC-23.75 and C-27, of which have already been produced, that has improved double lock of greater strength, that is universal in all six sections, has uniform thickness of metal, minimum weight for strength, and saving in weight as high as 20 per cent over some other sections, is described in Bulletin A of the Jones & Laughlin Steel Corp., Pittsburgh, Pa., which will be sent to interested contractors and engineers on request.

INSULATED AND WATERPROOFED ROOFS

Particularly adaptable to theatres, gymnasiums, auditoriums, public halls and many industrial buildings requiring large floor areas free from supports and obstructions, the Steeldeck roofs of Truscon I-plates and Truscon Ferrodeck are made of plates of copper-alloy steel of standardized lengths and widths, with ribs formed into them, and are described at length, and illustrated, in Bulletin No. 206 of The Truscon Steel Co., Youngstown, Ohio.

At the Coming Road Show

Take a look at our
AUTOMATIC TRACTOR SCRAPER

It's been successfully loading, dumping, spreading and leveling earth since 1921. It's particularly good for short hauls. You operate it by tractor power, with just one man to control everything from the seat. Our new "Back-Up Control," operates the scraper backward and forward like a shuttle, and eliminates all turning of tractor.

The Gustav Schaefer Wagon Co.
4180 Lorain Ave. Cleveland, Ohio

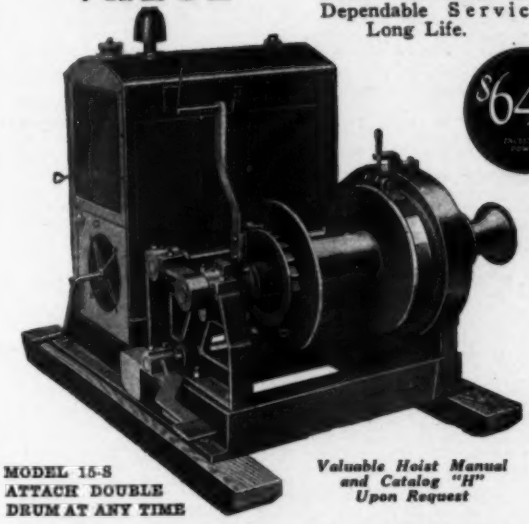
Yes, there's a circular. Why not send for it?

BROWN CLUTCH HOISTS

COMPARE for VALUE

FOUR - CYLINDER 12 - hp. LE ROI Power, 1500 Pound Single-line Capacity at 200 Feet Per Minute, Ball Thrust Bearings, Alemite-Zerk Lubrication, Machine Cut Nickle Alloy Semi - Steel Gears, Flanged Gear Guards, Spring-Suspended Brake Band, Steel Pawl. All These Ensure Dependable Service and Long Life.

$640

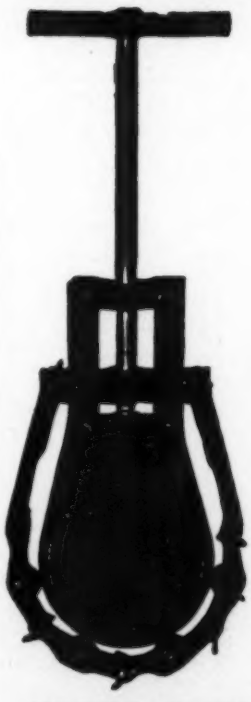


MODEL 15-S
ATTACH DOUBLE DRUM AT ANY TIME

Valuable Hoist Manual and Catalog "H" Upon Request

THE BROWN CLUTCH CO.
Sandusky, Ohio, U. S. A.
HOIST SPECIALISTS FOR MORE THAN TWENTY YEARS

ONE CUT SAVES THE PRICE



YOU, too, may save the cost of this pipe cutter on one job, just as many other contractors and water companies have done.

The ELLIS PIPE CUTTER

with its six keen rotary cutting blades eats its way right through any pipe in double - quick time. Use No. 01 for all kinds of pipe 4 to 8 inches in diameter, or No. 1 for pipe 4 to 12 inches in diameter.

Write for circular

ELLIS & FORD MFG. CO.
32 Piquette Ave. DETROIT, MICH.

Wire Cable Whipped and Cut in less than 1 minute

The Starrett Steel Band and Cable Cutter

(a kit tool) is a new method for binding and cutting any grade of wire cable —up to one inch.

Takes a minute and leaves steel sleeve on the end of the cable. No frayed ends or torn hands.

Write for prices and details

MORSE-STARRETT PRODUCTS CO.
1916 Broadway, Oakland, Calif.

ABSOLUTE ACCURACY IN WATER METERS

Complete information in regard to Neptune-built water meters, the accuracy of which is maintained by the most careful gaging and rigid inspection of every part before assemblying, will be sent on request by the Neptune Meter Co., 50 East 42nd Street, New York.

REINFORCED CONCRETE PIPE

Newark reinforced concrete pipe, which is laid in minimum time at minimum expense with minimum effort and when laid, has a minimum resistance to flow, is manufactured by the Newark Concrete Pipe Co., 462 Broad Street, Newark, N. J.

PUMPING HANDBOOK

The Novo Pumping Handbook, which is just off the press, contains a large amount of very valuable information in regard to every type of contracting pumping as well as a number of actual pumping experiences and problems which have been dealt with by contractors and which should be very valuable and interesting. It also contains a complete description of the various type of Novo engines and will be sent without obligation to any contractor interested by the Novo Engine Co., 216 Porter Street, Lansing, Mich.

CALCIUM CHLORIDE FOR CONCRETING

A booklet published by the Columbia Chemical Division, Pittsburgh Plate Glass Co., Barberton, Ohio describes in detail the use of calcium chloride in concrete work, particularly in highway building, and will be sent on request to any contractors interested.

A LUBRICANT FOR HEAVY-DUTY EQUIPMENT

D-A lubricant for lubricating tractors, trucks, shovels and other construction equipment will keep equipment on the job and save costly repairs and replacement parts and add to the length of service of the equipment. It is described in an illustrated circular of the D-A Lubricant Co., Inc., Indianapolis, Ind.

A FAST, QUALITY PAVER

Bulletin No. 120 of the Ransome Concrete Machinery Co., Dunellen, N. J., describes and illustrates the new paver of that company, the 13-E, that is a fast, quality paver designed to fill the need for a paver between the Ransome 27-E and 10-E, and especially adapted for city paving, alleys, small country roads, sewer work or any job requiring a portable medium size mixer.

PORTABLE BELT CONVEYORS WITH SHAKER SCREENS

Portable belt conveyors with single and double-deck shaker screens for sand, gravel, crushed stone, etc., with many desirable features, are described in an illustrated circular, No. RC-75, of the Chicago Automatic Conveyor Co., 1853 South 55th Avenue, Cicero, Ill., that is available to interested contractors and engineers on request.

A SMALL, LIGHT-WEIGHT DITCHER

A new light-weight service ditcher, Model 150, that is a small, portable unit exceptionally flexible in performance, with rugged construction and economical working ability of the larger machines of that company, and is especially suited for operation in restricted quarters where big excavators are unsuitable, is described in literature of The Buckeye Traction Ditcher Co., Findlay, Ohio.

MANGANESE STEEL AND ITS ADVANTAGES

The American Manganese Steel Co., 333 No. Michigan Avenue, Chicago, Ill., has recently issued a very attractive, pocket size brochure entitled "The Manganese Steel," that thoroughly describes Amsco manganese steel as to its history, advantages and application, dwelling mostly on facts, and giving to buyers of alloy steel parts and the engineering fraternity a short, interesting summary for quick interpretation, and a complete knowledge of manganese steel and its advantages.

A 2-SPEED SLACKLINE CABLEWAY HOIST

For operating slackline excavator buckets in sand, gravel or other material, the O. K. Clutch and Machinery Co., Columbia, Pa., has brought out a 2-speed slackline cableway hoist, Type TSBD 50, with gasoline or electric motor drive, that has superior construction features, simplicity of operation, and is described and illustrated in Hoist Catalog No. 28 of that company, that is available on request.

CRAWLER WAGONS FOR ECONOMICAL DIRT MOVING

The Euclid crawler wagon that is a strong and easily handled wagon in capacities of 5½ ton and 6 yards, that has wheels that have the same track surface and general dimensions as those used on wagons of 30 per cent greater gross weight, and that has frame and drawbars designed with ample factor of safety for maximum heaped loads, and wagon body made of 3/16-inch steel plate well stiffened with steel angles and steel corner gussets, is described in an illustrated circular of The Euclid Crane & Hoist Co., Euclid, Ohio.

A FULL ROTATING DERRICK

The Dobbie steel full rotating derrick and the full line of Dobbie timber derrick fittings and hand winches are described in catalogs which The Mundy Sales Corp., 30 Church Street, New York, will be glad to send on request.

PORTABLE WOODWORKING MACHINE

A complete description of a portable woodworking machine which enables the contractor to do the woodwork right on the job may be obtained from the American Saw Mill Machinery Co., 171 Main Street, Hackettstown, N. J.

SPEEDY PORTABLE MIXER

The Thru-A-Door Mixer for plaster, mortar or concrete, which is built to go through any 30-inch doorway or 6-foot floor opening and is portable and convenient, is described in a circular of the Blystone Manufacturing Co., Cambridge Springs, Penna., which will be sent on request to those interested.

LOCOMOTIVES FOR ROAD AND STREET BUILDING

Complete information in regard to Brookville locomotives, made in 15 standard models from 1½ tons to 12 tons in weight and equipped with McCormick-Deering-International power units, may be secured from Brookville Locomotive Co., Brookville, Pa.

OIL-BURNING KETTLE HAS MANY FEATURES

The Blue Book of Connery & Co., Inc., 4000 N. Second Street, Philadelphia, Pa., describes in detail the Style-J oil-burning kettle which includes among its features a low fuel cost, quick heating capacity, roller-bearing wheels and springs, absolute temperature control and solid rubber tires if desired. This book will be sent on request to those interested.

A HOT BLAST LANTERN

Details regarding the Victor hot blast lantern, sturdy and serviceable, for use on uptorn highways and water and sanitary system jobs, as well as several other styles designed to meet varying service and purposes, will be furnished on request by the R. E. Dietz Co., 60 Laight Street, New York.

NEW SETTING FOR DIAMOND CORE DRILL BITS

Sulamite, a metallic alloy having practically the same characteristics as carbon or black diamond, except that it is not so hard, and which has been used successfully as a setting for diamond core drill bits in soft sandstone, soft limestone, shale and other relatively soft sedimentary strata at lower first cost, is completely described and illustrated in Bulletin 80-H which may be secured from the Sullivan Machinery Co., 162 South Michigan Ave., Chicago, Ill.

A VERTICAL PLUNGER, DEWATERING, PUMP UNIT

Designed expressly as a dewatering force pump, the PDFL-8 unit of the Domestic Engine & Pump Co., Shippensburg, Pa., is suitable for use on all dewatering work, has an exceptionally high suction lift, is rugged and strong, and is described and illustrated in Bulletin 28-P of the company, which will be sent to interested parties on request.

NEW WATER REGULATOR FOR CONCRETE MIXERS

A new water regulator that is an accurate water tank in combination with a measuring device which allows for quick setting and changes in the water-cement ratio and quick allowance for the moisture contained in the aggregates of the mix is described in a printed circular of The Lakewood Engineering Co., Cleveland Ohio.

A NEW SKIMMER SCOOP FOR MOTOR-TRUCK MOUNTED EQUIPMENT

A new skimmer scoop that has been built for use on motor truck mounted equipment, that is readily adaptable to any standard Universal crane, being interchangeable with the other Universal attachments, such as clamshell or dragline or the back digger attachment, is described in literature which The Universal Crane Co., 1302 East 28th Street, Lorain, Ohio, will be glad to send on request.

CONCRETE BLOCK MACHINERY

National concrete block machinery, power machinery, concrete products mixers and other products of the Cement Block Machinery Co., 17 Durand Street, Newark, N. J., are described in a 12-page circular of that company, that is available on request.

MULTI-WALL PAPER BAGS TESTED AND APPROVED

A Multi-Wall paper bag which withstands a very severe water test as well as the roughest kind of handling is described in pamphlet BB 102 of the Bates Valve Bag Corp., 35 E. Wacker Drive, Chicago, Ill., which will be sent free on request.

A SOLDERING BLOW TORCH

A branding soldering blow torch which will operate in the open in any kind of weather, has a reinforced pump stand to prevent straining the connection, a self-cleaning needle valve, a tank of 16-gage copper and a burner with a guaranteed long life, is described in a pamphlet of the Everhot Manufacturing Co., Maywood, Ill., which it will be glad to send to anyone interested.

POWER SHOVEL WHICH GIVES BETTER RESULTS

The Star power shovel, scientifically designed throughout and capable of handling increased yardage, which gives larger output for less money because of its quick action, long reach, capacity for deep digging, compact design, crane boom and usefulness for all purposes, is described in considerable detail in Bulletin No. 53, put out by the Star Drilling Machine Co., 505 Washington Street, Akron, Ohio. Those interested in the Star power shovel may have a copy of this bulletin on request.

TIME SHEETS FOR CONTRACTORS

Time sheets for the building trade, prepared to include a record of time of each individual laborer on a job, total time, hour rate, total pay, deductions and net amounts as well as additional columns for labor in the various other departments of the work and a general labor distribution form have been prepared by the Concrete Form-Hold Corp., Culver Bldg., Culver City, Calif. These sheets may be secured without cost by the readers of CONTRACTORS AND ENGINEERS MONTHLY by writing the company and mentioning this magazine.

A HOIST FOR GENERAL CONSTRUCTION

The Lidgerwood Mfg. Co., Elizabeth, N. J., has developed the new Super-Utility 40 gasoline hoist rated at 4,000 pounds at 250 feet per minute for general construction work. Complete information and prices may be secured on request.

CONCRETE BLOCK MANHOLES

Bulletin P-109 of the Portland Cement Assn., 33 West Grand Avenue, Chicago, Ill., describes radical concrete block for manhole and catch basin construction and also gives the American Concrete Institute tentative specifications for concrete sewer manhole and catch basin block.

CONCRETE MIXED IN TRANSIT

The Paris transit concrete mixer which mixes the concrete enroute from the central proportioning plant to the job, is described in a folder which may be secured from the Transit Mixers Co., Inc., 436 Call Building, San Francisco, Calif.

DUMP AND CARRYING BUCKETS

A complete description of the automatic dump buckets of various types, self-dumping and self-righting hoisting buckets, tub hooks, iron dock blocks, side-dumping tip cars, charging wagons, and numerous styles of wheelbarrows manufactured by the G. L. Steubner Iron Works, Long Island City, New York, is contained in Catalog No. 75 which the company will be glad to send on request to those interested.

HOISTS AND DERRICKS

Hoists and derricks of various types fully equipped to insure easy operation and including safety features, are described by the Clyde Iron Works Sales Co., Duluth, Minn., who will be glad to send complete information in regard to this equipment to all interested contractors and engineers.

SELF-CONTAINED WELDING UNIT

A self-contained light weight, easily portable arc welder, particularly designed for structural work and pipe line construction, powered with a type H-9 four cylinder Red Seal Continental engine which furnishes abundant power for every purpose is described in recent information from the Continental Motors Corp., Industrial Equipment Division, Muskegon, Mich.